DOCUMENT RESUME

ED 087 086 EA 005 827

TITLE	Proceedings. Association of Physical Plant Administrators of Universities and College Annual Meeting. (60th, Honolulu, Hawaii, April 7-12, 1973.)
INSTITUTION	Association of Physical Plant Administrators of Universities and Colleges, Washington, D.C.
PUB DATE	73
NOTE	113p.; A related document is ED 073 560
AVAILABLE FROM	Association of Physical Plant Administrators of Universities and Colleges, Suite 510, One Dupont Circle, Washington, D. C. 20036 ($10.00 hard-bound)
EDRS PRICE	MF-$0.65 HC Not Available from EDRS.
DESCRIPTORS	*Administrative Personnel; Air Conditioning; *Annual Reports; *Building Operation; Campus Planning; Cost Effectiveness; Equipment Maintenance; *Higher Education; Meetings; Offices (Facilities); Planning (Facilities); Professional Associations; Safety; *School Maintenance; Security; Speeches; Unions

ABSTRACT

This presentation is comprised of 12 session papers and the text of a large institution experience exchange session dealing with various aspects of campus physical plant maintenance. Among the subjects covered are unionism; fire safety; air conditioning water treatment; cost and performance control; housekeeping consultants; Building design for easy maintenance; a faculty office furniture and structure system; air conditioning; OSHA, Occupational Safety and Health Act; electrical equipment preventive maintenance; campus security; and economic justification for office landscaping. (Photographs may reproduce poorly.) (MLF)

ED 087086

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

PROCEEDINGS OF THE SIXTIETH ANNUAL MEETING OF THE ASSOCIATION OF PHYSICAL PLANT ADMINISTRATORS OF UNIVERSITIES AND COLLEGES

APRIL 7-12, 1973
HONOLULU, HAWAII

Hosted by
THE UNIVERSITY OF HAWAII
Philip W. Koehler, Chairman

EA 005 827

PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL BY MICROFICHE ONLY HAS BEEN GRANTED BY
Assn. of Physical Plant Admin of Univ and Colleges
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER

Copyright 1973. This book or any portion thereof may not be reproduced without the permission of The Association of Physical Plant Administrators of Universities and Colleges, Suite 510, One Dupont Circle, Washington, D.C. 20036.

TABLE OF CONTENTS

Board of Directors . . . 6

The Hawaii Story . . . 9

Annual Business Meeting . . . 14

Meritorious Service Award Recipients . . . 20

Unionism in Physical Plants by David Trask . . . 23

Patton Plan for Fire Safety Applied to Universities by Richard Patton . . . 27

Air Conditioning Water Treatment-Savings and Techniques by Louis Astbury . . . 31

Cost and Performance Control for Building Maintenance by John Lammers . . . 39

Beware of Housekeeping Consultants by Edward Feldman . . . 43

Building Design for Easy Maintenance by James Crockarell . . . 51

The Faculty Office-A System of Furniture and Structure by Hunt Martin, Jr. . . . 55

Air Conditioning-The Air Side by Ned Mann . . . 61

Sex of OSHA by Gene Cross . . . 65

The Alaska Story . . . 74

Electrical Equipment Preventive Maintenance by Grant Niver and R.L. Golden . . . 75

Campus Security by Dave Wallbom . . . 81

Economic Justification for Office Landscaping by A. Litchard Dickinson . . . 89

Experience Exchange-Large Institutions . . . 94

Acknowledgements . . . 101

Registration List . . . 103

Host Committee Acknowledgements . . . 112

T. B. SIMON

MICHIGAN STATE UNIVERSITY

PRESIDENT, 1972-73

A MESSAGE FROM THE PRESIDENT

We are indeed pleased to welcome you to the Sixtieth Annual Meeting of The Association of Physical Plant Administrators of Universities and Colleges.

From an initial meeting in 1914 of a small, but hardy, group of midwestern Buildings and Grounds Superintendents, who traveled by train to Chicago, to a jet age assembly of a large group of delegates in Hawaii is truly symbolic of the changes we are experiencing in physical plant operations and management technique.

The successful physical plant administrator of the future, among other things, must develop effective lines of communication not only with his own personnel but with his peers and avail himself of their experience. A review of the Association's history will show that it has developed into a large, meaningful group effectively providing a medium of exchange of knowledge among its members.

May our meeting in Honolulu be a memorable and enjoyable experience and bring to you the most pleasant and beneficial results.

Cordially,
T. B. Simon
President, APPA
1972-73

BOARD OF DIRECTORS
1972-73
OFFICERS

President	Ted B. Simon	Michigan State University
President-Elect	George C. Moore	University of Cincinnati
First Vice President	Philip W. Koehler	University of Hawaii
Vice President for Professional Affairs	L. Terry Suber	Colorado State University
Vice President for Membership	Walter W. Wade	Purdue University
Vice President for Programs	Harry F. Ebert	Duke University
Secretary	John H. Sweitzer	Earlham College
Immediate Past President	Clyde B. Hill	University of South Florida
Executive Director	Paul T. Knapp	

REGIONAL REPRESENTATIVES

Eastern	Peter P. Welanetz	Williams College
	William M. Stanton	Swarthmore College
Southeastern	Calvin C. Greene	University of Florida
	Nestus H. Gurley	University of North Carolina
Midwest	Howell H. Brooks	Indiana University
	Edwin V. Lyon	University of Notre Dame
Central	Charles S. Dawson	Southern Methodist University
	Case A. Bonebrake	Kansas State University
Rocky Mountain	Gene B. Cross	University of Utah
	Robert Arnold	University of Wyoming
Pacific	Bruce Rutherford	Washington State University
	V. Burt Cowman	University of California at Los Angeles

ALOHA APPA '73 The registration desk in the lobby of the exotic Hilton Hawaiian Village Hotel was the first stop for many APPA commissioners arriving from the Honolulu Airport. At the airport they received their first, but not their last, "Aloha" greeting, lei and a special welcome to Hawaii.

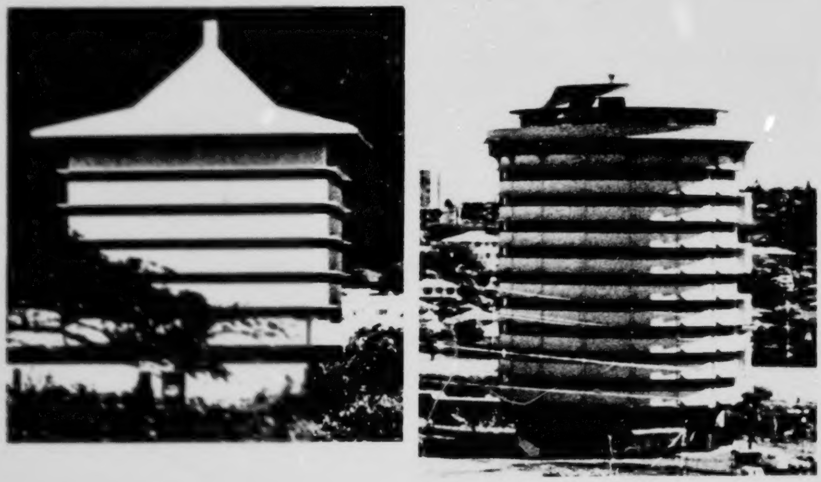
THE UNIVERSITY OF HAWAII STORY

The University of Hawaii, Manoa, host of the 1973 APPA Annual Meeting, is the principal campus in the nine-campus, 48,000-student statewide university system. The 300-acre campus is in the Manoa Valley, a residential area close to the heart of Honolulu, the state capital. Approximately 4,500 full and part-time faculty and staff are employed by the university, which operates on an annual budget of $44 million provided by state and federal funds.

The Department of Facilities Management of the Manoa campus under Director Philip Koehler is responsible for custodial service, grounds maintenance, building/road and parking lot repair, utilities maintenance (there is no power plant and all electricity is purchased from Hawaiian Electric), refuse collection, trucking and moving, warehousing, safety and space management or assignment.

For the past year, Hawaii's Governor has frozen hiring and no vacancies created by resignations or retirements have been filled. Consequently, although the Department has added responsibilities, staff has declined to 200. There are an additional 80 part-time student employees and about 10 carpenters, electricians and painters employed under a very expensive, full time labor contract. Using staffing standards developed for campus maintenance, the University should have about 406 employees in order to adequately maintain a facility of its size—304 acres and almost 4 million square feet of building space. The worst problem is custodial service. Ed Feldman (Service Engineering Associates, Inc.), who has acted as consultant to the University for about five years, estimates the school should have 237 positions by 1974-75; there are now only 112 custodians with four more retirements expected shortly.

Chancellor of the University, Wytze Gorter, noted in his welcoming address before the APPA convention that this era of budgetary restraints is a difficult time in which to maintain any kind of university physical plant, a condition he has observed on many campuses besides his own. He said, "One of the sad things I see as an economist and administrator is that as we cut back resources available to the university, quite clearly for short periods of time the place to cut seems to be maintenance. Reducing expenditures in that area achieves some initial savings. However, the ultimate result of deferred maintenance is often emergency repair involving demolition and serious trouble."



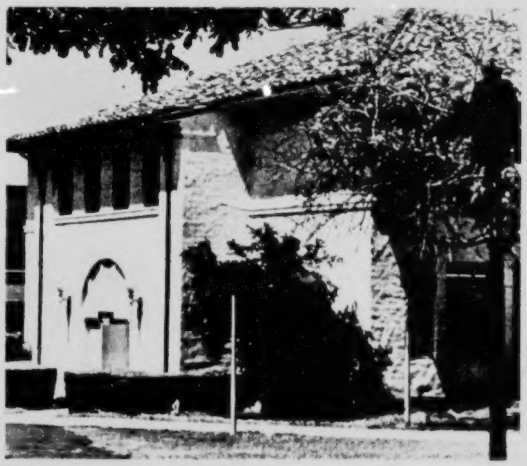
ALL SHAPES, SIZES— Manoa campus buildings come in all shapes and sizes. (Far left) The Biomedical Sciences Building with its distinctive pagoda-styled roof was completed in the fall of 1970. Cylindrical building (Left) is one of the four proposed Hale Aloha high-rise dormitories. Two of the dorms were completed in the fall of 1972, with Phase II of the construction under way in 1973.

According to Koehler the present predicament is the result of past inadequate maintenance budgets. Campus maintenance normally comprises 9-10% of the total budget of a university. The Manoa campus maintenance budget is 6.58% of the total campus expenditure for 1972-73 and will fall to 6.29% by fiscal year 1974-75. To look at it another way, in 1961-62 the budget allotment was $1.30/sq. Ft., while in 1974-75 it will fall to $.82/sq. ft., despite a 50% loss in the buying power of the dollar during the same period. This trend has been apparent from 1961-62 through the present - absolute increase in budget, but decrease in allotment per square foot.

The Chancellor noted: "Nine years ago the University of Hawaii budget was between $15 and $16 million, increasing to $20-$25 million within a few years and now operating near $70 million for the upcoming fiscal year. Building programs are developing nicely, but the Department of Facilities Management suffers every time one is completed and the staff must add maintenance of it to the department's already overburdoned program." Gorter added: "Phil Koehler has been doing an excellent job keeping the campus well-maintained under very difficult circumstances. Koehler says he uses the 'skip' method—when maintenance staff was reduced it was necessary to skip certain cleaning days for a building. He later informed me that he was using the 'skip skip' method, and as I understand it now, he employs the 'triple skip' system—being forced to allow cleaning certain areas to go weeks rather than just days, without attention."

"The maintenance budget just has not kept pace with the very aggressive construction program," Koehler claims. "In 1961 there was one million square feet and by 1974-75 this figure will have quadrupled. The problem of inadequate budgets is not unique, but it is a fault of the budgetary structure when adequate funds and personnel to maintain a building are not included somewhere in the planning process or cost benefit analysis of an academic program," he adds. "As a consequence, the so-called "fixed" expenses for utilities, salaries, maintenance contracts and off-campus rentals now total the whole next year's allotment for the department. Where the money will come from to buy paint, lumber, repair material, toilet tissue, fertilizer and all those other things needed to keep the campus operating is still in question."

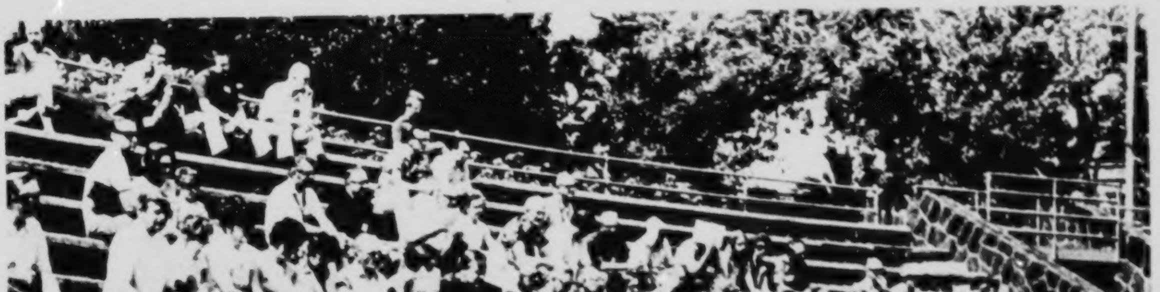
The area that will cause the most concern in the future is safety and compliance with OSHA. The entire Campus Safety Division consists of two positions, a Campus Safety Officer and a Radiation Safety Officer, the latter overseeing the "broad" AEC license for the entire University system which includes certain hospitals, all community colleges and extending as far as the research facilities on Kwajalein, farther out is the Pacific. The Campus Safety Officer resigned as of December 1st and the university is still awaiting approval of the emergency request to fill that position. As



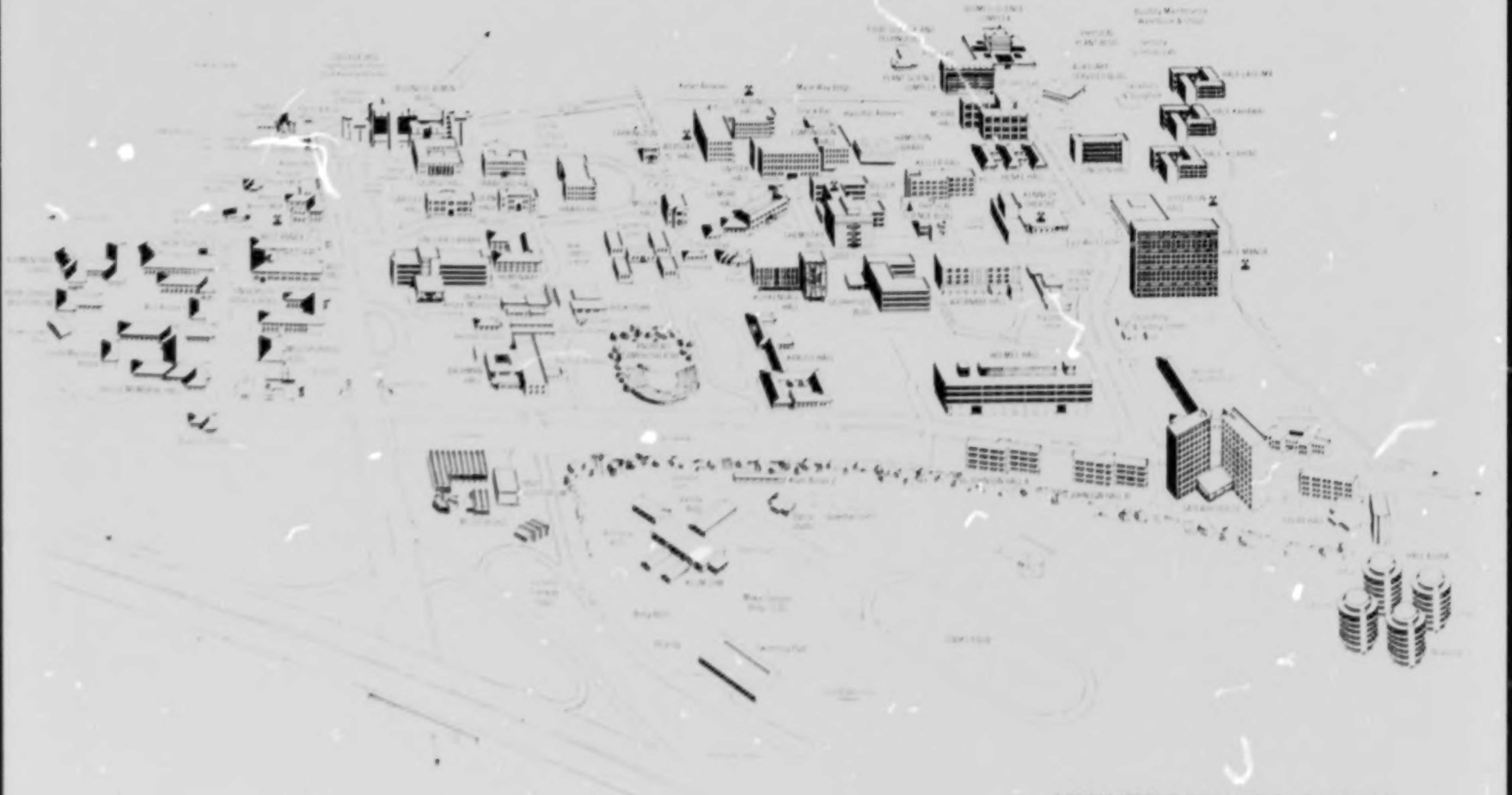
MORE CONTRAST—The Manoa campus is rich with it! The traditional architecture of Wist Hall (Right), part of a complex of buildings similar in design, stands against the sharp modern lines of the Kennedy Theatre (Below) located in a cluster of contemporary structures across campus.

incongruous as it may sound, in 1971 the university received the National Safety Council's Certificate of Commendation and in 1972, the Council's Award of Merit for its safety program.

The entire Facilties Management Department is unionized. Of the thirteen units into which state government employees are divided by law, five units are represented in the Department: Blue collar nonsupervisory, blue collar supervisory, white collar nonsupervisory, white collar supervisory and nonfaculty Board of Regents appointees. The last unit is the one to which the director of facilities management belongs. These units are represented by either the United Public Workers or the Hawaiian Government Employees Association, both of which are affiliated with the American Federation of State, County and Municipal Employees, an affiliate of AFL-CIO. "Since contracts for all five units have only been negotiated within the past few months, it is still too early to tell how this will all work," Koehler concludes.



UNDER THE MORNING SUN—Phil Koehler addresses the convention in Andrews Amphitheatre on his favorite subject-operation of the University's Physical Plant Department.

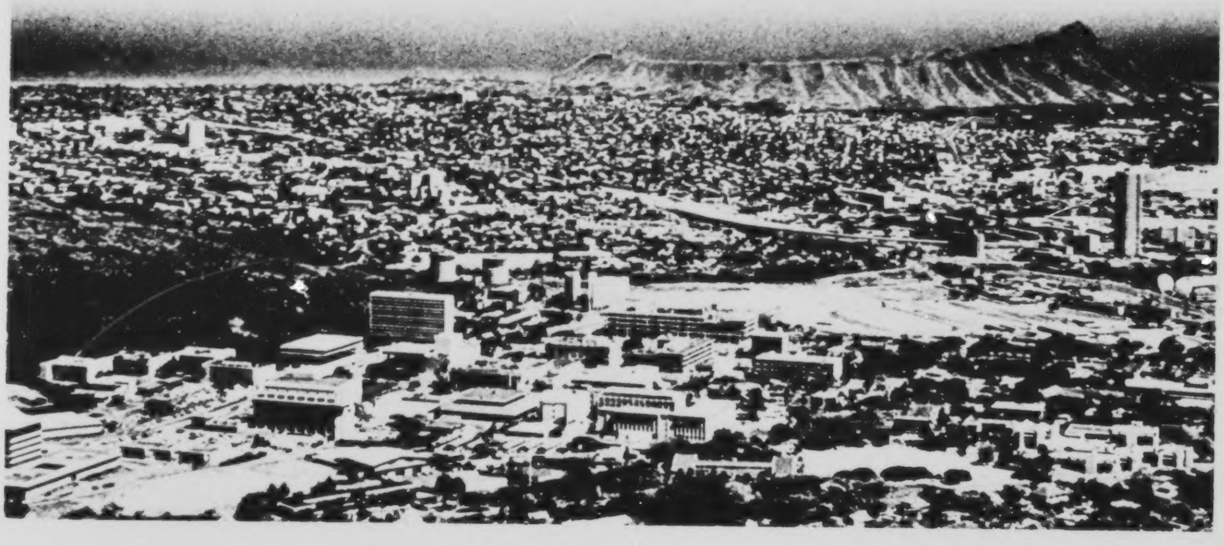


UNIVERSITY OF HAWAII
MANOA CAMPUS

REMEMBER WHERE YOU WERE?—Map of the mushrooming Manoa campus: Started as a land grant college, the University now enrolls students from all 50 states and 74 foreign countries with about 1,800 of the student body from the mainland U.S. and about 1,100 from foreign countries. Among the campus buildings are two major libraries with a total of 1.2 million volumes, encompassing special collections in Hawaiian, Pacific and Asian materials, government documents, rare books and the University Archives.

WALTER MURAOKA—Director Physical Planning and Construction for the University, Muraoka addressed the convention regarding the University's construction program.

PILLARS AND PLANTS—The campus has a variety of pillared facades and an abundance of plants like those in front of Holmes Hall (Above) and Hawaii Hall (Left). The campus is a living botanical garden with 560 different kinds of trees and plants landscaping the grounds.
Aerial photo of the campus (Below) includes a view of the extinct volcano crater now a World War II shrine and burial ground.



MINUTES OF THE 60TH ANNUAL BUSINESS MEETING

President Ted Simon presided and opened the meeting at 8:30 a.m., April 20, 1973 at the Hilton Hawaiian Village, Honolulu, Hawaii.

He introduced and gave a special word of welcome to the following Past Presidents who were present: Sam Brewster, Bill Zellner, J. McCree Smith, Jean Gratton, George Weber, and Clyde Hill.

REPORTS OF OFFICERS

President

Ted Simon reported 167 new members since the last Annual Meeting, enabling the Association to meet the goal of 1000 members. He reported the new central office is fully operational and producing significant results. Site selection problems have been resolved for 1974 and 1975.

The Association worked with the National Association of College and University Business Officers in the presentation of a Physical Plant Management Institute for black and small colleges held in New Orleans in October. Members helped prepare a manual which was used as part of the program. This manual is being revised and will ultimately be published and made available.

The Professional Affairs Committee published several technical papers and the Research and Survey Committee released a report on Comparative Staffing. Officers have been working with legal counsel to study the need for incorporation and for a possible change in tax exempt status.

President Simon thanked each member for his support and cooperation.

Secretary

John Sweitzer reported that the minutes of the last Annual Business Meeting were presented in the bound volume, *Minutes of the Fifty-Ninth Annual Meeting*, which was mailed to all members. Since there were no additions or corrections, Gene Cross moved and Ralph Gates seconded a motion to approve the minutes as presented. Motion carried.

President-Elect

George Moore announced the 15th Annual Workshop Program for Physical Plant Administrators.

One workshop will be held at the University of Cincinnati, August 5-10, 1973, with Ray Smith as chairman. Another will be at the University of California at Santa Barbara, August 12-17, 1973, with John Gabe, chairman. The registration fee for each workshop will be $75.

Ralph Tuomi moved and Howell Brooks seconded a motion to approve this report. Motion carried.

Vice President for Programs

Harry Ebert announced the next annual meeting will be held June 2-5, 1974 at the Shamrock Hilton Hotel in Houston, Texas. The following annual meeting will be held June 15-18, 1975 at the Salt Lake Hilton Hotel in Salt Lake City, Utah. The annual meeting in 1976 will be held in the Eastern Region and the 1977 meeting will be located in the Southeastern Region. The Program Committee and the Executive Director are working with the appropriate regions on the question of site selection and their recommendations will be presented to the membership for final decisions.

Harry Ebert expressed thanks to Paul Knapp for a year of full and competent support to the office of Vice President for Programs. Phil Rector moved and Burt Cowman seconded a motion to approve this report. Motion carried.

Vice President for Professional Affairs

Terry Suber reported five issues of the *APPA Newsletter* have been published in a new format, and he solicited comments on the style and contents. A new brochure has been distributed. This combined information about APPA's 60th Annual Convention with a general description of APPA and its membership requirements. The first three issues of Technical Papers have been published in the new format as separate papers which may be included in the blue Reference Manual.

The Standards Committee, under its new title of Research and Survey Committee, has published and distributed *The*

Comparative Staffing and Operations Study for Physical Plant Functions of Universities and Colleges, 1972, under the chairmanship of Gene Cross.

A Bi-Annual Unit Cost and Wage Survey has been authorized for the third quarter of 1973.

The Reference Manual Revision Committee has revised and updated every section of the manual. Terry Suber recommended that this committee be dissolved and that the Vice President for Professional Affairs, in cooperation with the Executive Director, be responsible for keeping the manual up to date.

John Sanderson moved and Burt Cowman seconded a motion to approve this report. Motion carried.

Vice President for Membership

Walter Wade reported a gain of 167 new members in the past year, giving a total of 1002 members as of today, with members from every state in the U.S., every province in Canada, plus a number of other countries. A Certificate of Membership was presented to the 1000th member, Clayton Carpenter from the University of Nevada.

Harold Babcock moved and Eugene Miller seconded a motion to approve this report. Motion carried.

First Vice President

Philip Koehler reported 536 registrants with 36 booths sold to exhibitors, of which 40% did not exhibit at last year's meeting. The regional count of members who registered in advance was:

Eastern	61
Southeastern	20
Midwest	55
Central	22
Rocky Mountain	11
Pacific	49
	218

Raymond Orlando moved and John Sanderson seconded a motion to accept the report as presented. Motion carried.

Immediate Past President

Clyde Hill reported on the activities of the National Association of College and University Business Officers Facilities Committee on which he has served. The committee has met with high government officials from H.E.W. and H.U.D. It took the position that H.U.D. should *not* declare a moratorium on housing payments, since this would have a negative affect in the financial world of universities and colleges. Only 00.3% of the loans were found to be delinquent, which is lower than most private delinquency rates. The Committee recommended to H.U.D. that each case be studied individually and assistance or action taken as needed on an individual basis.

The Committee considered a possible proposal from H.E.W. to provide money for updating of maintenance where there had been deferred maintenance at an institution. The Committee felt that to implement such a program would tend to reward an institution for doing a poor job of maintenance, while those who had done a good job would get nothing. The Committee again recommended establishing outright grants for academic facilities but to also extend the provision to renovate space for a changing function or to upgrade and modernize buildings.

Eugene Miller moved and Howell Brooks seconded a motion to approve this report. Motion carried.

Executive Director

Paul Knapp reported the Central Office was opened on June 12, 1972 in space leased from the National Association of College and University Business Officers at One Dupont Circle in Washington, D.C. Maureen Philliban began work as secretary on August 1, 1972. The files were transferred from Portales, New Mexico to the Central Office in early fall. A system of bookkeeping has been developed. The mailing list has been updated and set on Addressograph plates. The Central Office cooperated with membership promotion and this increased activity was reflected in a heavier load of paper work.

Paul Knapp has travelled 25,708 miles on Association business since last July. The travel can be divided basically into two catagories: investigation of possible sites for annual meetings, and attendance at meetings (national, regional, chapter, board, and similar association meetings).

Much time has been spent on developing working relationships with other organizations, with business and professional publications, and with governmental agencies.

Five issues of the *Newsletter* have been published and distributed. Both input and feedback would be appreciated. The Central Office cooperated with the Professional Affairs Committee in the publication and distribution of three Technical Papers in a format which is designed for filing in the blue APPA Reference Manual. The staff also worked closely with the Research and Surveys Committee in printing and mailing the *Comparative Staffing and Operations Study.*

The Central Office provided editorial and clerical support for preparation of the initial draft of the manual on *Physical Plant Administration, Methods and Procedures for Small Colleges and Universities*, which was used in conjunction with the Physical Plant Management Institute conducted last fall in New Orleans.

Paul Knapp has worked with the Board of Directors and its attorney to study the feasibility and procedures for incorporation and for a change in tax status. Paul Knapp states, "We are over the initial hurdles and with the continued guidance and assistance of a progressive, imaginative and hard-working Board of Directors, guided and assisted by the membership, this next year will be one of continued achievement."

The proposed budget for next year is $92,300 and with an anticipated surplus of $10,000 from this Annual Meeting, the budget should be balanced. Total assets at the end of March, 1973 were $99,103.82.

Ralph Tuomi moved and John Tronoff seconded a motion to accept this report. Motion carried.

George Sano and Charles Braswell expressed concern about the way in which the mail ballot was used to elect officers. No date has been set for the return of ballots, and the procedure did not guarantee that only full members could vote.

Memorials were presented honoring the following members who died during the past year:

Richard Alton Adams — Oregon State University
Olan Ray Downing — Texas Technical University
Robert H. Heidrich — Amherst College
Ernest P. Hendrix — University of Missouri-Rollo.

REPORTS OF COMMITTEES

Physical Plant Management Institute

George Weber reported on a successful program, sponsored cooperatively with N.A.C.U.B.O. Eighty-eight persons attended the Institute in New Orleans. Unfortunately funds do not seem to be available to repeat the program next year.

He also reported on an approach to formula budgeting which he had prepared. Copies were distributed. He also distributed copies of the operating manual for the Department of Physical Plant at the University of Maryland. He also reported on the availability of a 15 minute slide show describing modular construction at College Park.

Long-Range Planning

This report was accepted by the Board of Directors and was turned over to the Executive Committee for review and implementation. The report will be published and comments will be welcomed.

Research and Survey

Their report on *Comparative Staffing* has been published and the committee will welcome suggestions regarding further research and survey projects.

Ad Hoc Finance Committee

Pete Welanetz reported the Association is covered by all types of liability, compensation, fire, and other necessary insurance as well as bonding coverage for all Officers, Directors, the Executive Director, and others charged with handling APPA funds, to the extent of $75,000.

Guidelines have been established for the investment of surplus funds using the principal of security, plus reasonable ease of liquidity. Welanetz reported the Association is in very sound financial condition and the Board of Directors has voted unanimously *not* to recommend any change in the dues for the coming year.

Charles Dawson moved and Howell Brooks seconded a motion to approve the preceding part of this report. Motion carried.

Pete Welanetz presented a chronological list of important decisions leading through the study of incorporation for APPA. He started with the Board Meeting April 17, 1971 in Tuscon and traced the progress to date. He reported the Board had voted unanimously to adopt the following resolutions:

(Resolution No. 1)

RESOLVED, That the Association of Physical Plant Administrators of Universities and Colleges should not continue to operate as an unincorporated association but should reorganize as a nonprofit corporation and do so under the laws of the District of Columbia;

That the Articles of Incorporation of the Association, a copy of which is attached hereto and incorporated herewith, be and hereby are approved by this Board;

That such Articles be submitted to the Association's voting membership for reaction and comment as soon as is reasonably possible following the date of adoption of this resolution, and that such Articles be subsequently submitted to a vote of the Association's members entitled to vote in respect thereof.

And that, if a majority of the voting members shall vote in favor of such Articles, the Executive Director of the Association shall thereupon take such action as may be required or necessary to cause the Association to become incorporated under the nonprofit corporation laws of the District of Columbia.

(Resolution No. 2)

RESOLVED, That the Bylaws of the Association, a copy of which is attached hereto and incorporated herewith, be and hereby are approved by this Board;

And that such Bylaws be submitted to the Association's voting membership for reaction and comment as soon as is reasonably possible following the date of adoption of this resolution, and that such Bylaws be subsequently submitted to a vote of the Association's members entitled to vote in respect thereof.

(Resolution No. 3)

RESOLVED, That, whereas the Association of Physical Plant Administrators of Universities and Colleges is presently deemed, for federal tax purposes, to be an organization described in Section 501(c)(6) of the Internal Revenue Code of 1954, and whereas, the Association is desirous of securing a revision of such status so as to be deemed, for federal tax purposes, an organization described in Section 501(c)(3) of the Internal Revenue Code, the Association shall change its organizational structure from that of an association of individual voting members to that of an association of institutional (including systems of institutions of higher education) voting members; and that the Executive Director of the Association shall be and hereby is directed to take whatever other actions shall be required or necessary to cause the Association to qualify for a determination that the Association is eligible for classification as an organization described in Sections 501(c)(3) and 509(a)(1), (2) or (3) of the Internal Revenue Code.

(Resolution No. 4)

RESOLVED, That the constitution of the Association of Physical Plant Administrators of Universities and Colleges be abolished, inasmuch as the constitution is to be replaced by the Articles of Incorporation and Bylaws heretofore adopted and approved;

That appropriate notice of this decision of the Board be communicated to the voting members of the Association as soon as possible following the passage of this resolution;

That such decision of this Board be submitted to a vote of members entitled to vote in respect thereof at the appropriate time in calendar year 1974;

And that, if a majority of the voting members shall vote in favor of such action of the Board, the constitution of the Association shall be forever dissolved and abolished.

(Resolution No. 5)

RESOLVED, That all of the liabilities and obligations of the Association of Physical Plant Administrators of Universities and Colleges, operating as an unincorporated association, and all of the assets and properties thereof, shall be fully assumed by the Association of Physical Plant Administrators of Universities and Colleges, Inc., at such time as the Articles of Incorporation for the Association shall gain such approval as shall be requisite under the laws of the District of Columbia.

The Board voted unanimously not to vote on incorporation until on or after November 1, 1973 in order to give members ample time to study the issue and to allow for further Board action at the December Mid-year meeting. The Board also voted unanimously to send copies of the Resolutions, Articles of Incorporation and Bylaws to all members as soon as possible. John Sweitzer discussed the effect of proposed changes on members and these remarks will also be distributed to all members.

John Sweitzer presented the following official notices: Inasmuch as the Association of Physical Plant Administrators of Universities and Colleges is considering the adoption of certain Articles of Incorporation and Bylaws, notice is hereby given that resolutions to dissolve and abolish the present Constitution and Bylaws will be presented to the Membership for consideration and action at the next Annual Business Meeting of the Association. Members were urged to study these documents and to contact Regional Representatives if there are questions or need for clarification.

Clyde Hill explained that if the members voted this fall in favor of incorporation with new Bylaws, the Board of Directors would then proceed to implement this decision at its Mid-year Meeting. In effect, there would briefly be two organizations: the new corporation and also the old "paper organization" until it is officially voted out of existence at the next Annual Business Meeting.

In response to a question from Billy McKay, President Simon explained that regional associations will be urged to discuss these questions before the vote of the members which will be taken in the fall. Billy McKay recommended that Article Six of the Articles of Incorporation be simplified by transferring the details of the various qualifications of membership to the Bylaws where they could be modified more easily. Pete Welanetz agreed to communicate this recommendation to the Association's attorney.

Charles Braswell asked for clarification of the phrase, used in Article III of the Bylaws, "The institution must operate an *independent* physical plant." Harry Ebert suggested the term "separately identifiable" instead of "independent." He also asked about Article XII of the Bylaws which says that regional associations may affiliate with APPA, Inc., as long as they qualify as organizations exempt from federal income tax under Section 501 (c) (3) of the Internal Revenue Code.

President Simon said that legal advice will be made available upon request to regional associations which choose to apply for tax exemption. However, he said that it will not be necessary for a region to be affiliated in order to have a voice in the control of APPA, Inc. Control will be through the voting members.

Pete Welanetz reported the Association attorney had said there would be no problem with Canadian or foreign members unless they comprised more than 40% of the voting membership. He also said there would be no problem if a Canadian region developed and came into the organization *after* the Association achieved the 501(c)(3) status, provided they meet the qualifications, such as institutional membership, etc.

In response to a question from the floor, Gene Cross answered that chapters which are integral parts of regional associations should not only be allowed but also encouraged.

Nominating Committee

The President determined that a quorum was present. Bruce Rutherford presented the following nominations:

President-Elect
  L. Terry Suber – Colorado State University
  Raymond Halbert – University of Missouri
Vice President, Professional Affairs
  Gene Cross – University of Utah
  Phil Rector – California Institute of Technology
Vice President, Membership
  Bill Stanton – Swarthmore College
  V. Burt Cowman – U.C.L.A.
Vice President, Programs
  Harry Ebert – Duke University
Secretary
  John Sweitzer – Earlham College

David Reichart reported the following results of the election as counted by the Audit Committee:

President-Elect – Raymond Halbert
Vice President, Professional Affairs – Gene Cross
Vice President, Membership – William Stanton
Vice President, Programs – Harry Ebert
Secretary – John Sweitzer

NEW BUSINESS

Phil Koehler said, "It is time for the Board of Directors to evaluate their actions and to be more responsible, to be firm in their actions in support of the constitution and to be more responsive to the members. As our association grows in size, it becomes much more important that our Board of Directors be the leaders in the fight to preserve the constitution and to assure that every action that is taken follows the language and intent of the constitution."

Ted Simon presented the gavel to George Moore, the new President. George Moore said he has belonged to APPA for 16 years and he now looks forward to working with the officers and members toward three goals:

1. Communication;
2. Strengthen the Annual Meeting;
3. Increase the membership and get the records in order.

He also hopes to get to know more members personally.

Meeting adjourned at 11:20 a.m.

IN MEMORIUM

ROBERT H. HEIDRICH

WHEREAS, our beloved friend and member, Robert H. Heidrich, was taken from us on September 3, 1972, and his departure leaves us saddened by his absence, and

WHEREAS, he was an active participant in this Association, having served on its Board of Directors and as President of the Eastern Region of APPA, and

WHEREAS, his service, as Director of Construction for Kirkland College, Clinton, New York, and earlier as Superintendent of Buildings and Grounds at Amherst College, Amherst, Massachusetts, a position from which he retired in 1970, was a credit to himself and his profession,

THEREFORE, BE IT RESOLVED that this testimonial of a grateful organization be read to the members in attendance at the 60th Annual Convention of The Association of Physical Plant Administrators of Universities and Colleges; that it be printed in the minutes of that meeting; and that a copy of this resolution be presented to the surviving widow with our condolences.

Approved by the Board of Directors this 8th day of April, 1973.

ERNEST P. HENDRIX

WHEREAS, our beloved friend and member, Ernest P. Hendrix, was taken from us on May 1, 1972, and his departure leaves us saddened by his absence, and

WHEREAS, he was an active participant in the activities of this Association and the Central States Region of APPA, and

WHEREAS, his service, as Superintendent of the Physical Plant at the University of Missouri, Rollo, Missouri, was a credit to himself and his profession, and

WHEREAS, his contributions to his community endeared him to all who knew him,

THEREFORE, BE IT RESOLVED that this testimonial of a grateful organization be read to the members in attendance at the 60th Annual Convention of The Association of Physical Plant Administrators of Universities and Colleges; that it be printed in the minutes of that meeting; and that a copy of this resolution be presented to the surviving widow with our condolences.

Approved by the Board of Directors this 8th day of April, 1973.

RICHARD ALTON ADAMS

WHEREAS, on September 30, 1972, one of our most faithful, hard working, and popular members, Richard Alton Adams, was taken from us, and his departure leaves us saddened by his absence, and,

WHEREAS, his significant contributions to this Association, as a member of its Board of Directors, as President and NEWSLETTER Editor in 1961-1962, as recipient of its Meritorious Service Award in 1965, and, finally, as Editor of the APPA NEWSLETTER from July, 1964, to September, 1972, will long be remembered and cherished, and

WHEREAS, his service to Oregon State University, as Director of Physical Plant for 22 years, and his assignment as Director of Planning and Construction for two years prior to retirement in 1971, was a credit to himself and his profession, and

WHEREAS, his unselfish devotion to his community of Corvallis, Oregon, was an inspiration to all who knew him, and

WHEREAS, his warm companionship, his sincere cordiality, and his vivid, creative imagination have made an indelible impact upon the past and future of this organization,

THEREFORE, BE IT RESOLVED that this testimonial of a grateful organization be read to the members in attendance at the 60th Annual Convention of The Association of Physical Plant Administrators of Universities and Colleges; that it be printed in the minutes of that meeting; and that a copy of this resolution be presented to Mrs. Gemma Adams, his surviving widow, with our condolences.

Approved by the Board of Directors this 8th day of April, 1973.

OLAN RAY DOWNING

WHEREAS, on February 9, 1973, our beloved friend and member, Olan Ray Downing, was taken from us, and his departure leaves us saddened by his absence, and

WHEREAS, he was a loyal and faithful member of this Association and the Central States Region of APPA for many years, and

WHEREAS, his contributions to Texas Technical University, as Director of Building Maintenance and Utilities, and to the community of Lubbock, Texas, will live long in the memories of his many friends and associates,

THEREFORE, BE IT RESOLVED that this testimonial of a grateful organization be read to the members in attendance at the 60th Annual Convention of The Association of Physical Plant Administrators of Universities and Colleges; that it be printed in the minutes of that meeting; and that a copy of this resolution be presented to the surviving widow with our condolences.

Approved by the Board of Directors this 8th day of April, 1973.

1973-74 MERITORIOUS SERVICE AWARD RECIPIENTS

In recognition of their faithful, outstanding, and significant services to APPA. Awards presented by Martin Whalen, University of Montana, at the Annual Banquet. Award presented to Gerald Hawk in absentia.

Gerald Hawk, Director of Physical Plant
New Mexico State University at Portales, New Mexico

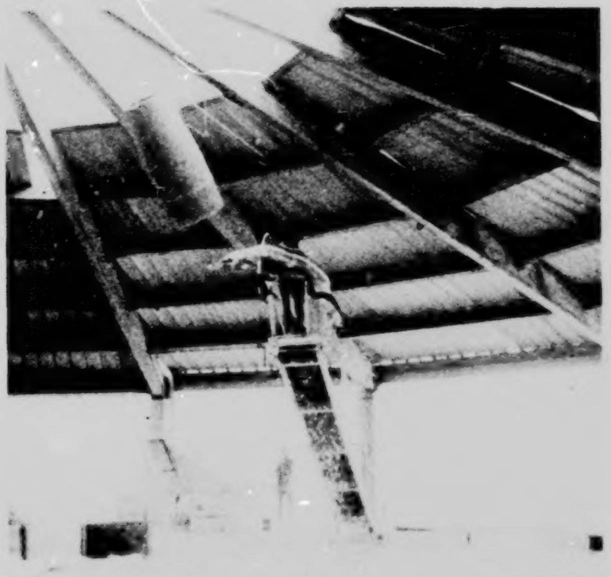
A relative newcomer to APPA, Hawk is one of its most active members. He served as Interim Executive Director of APPA, and his devotion to duty brought him a special recognition award from APPA at the close of that term one of two such awards ever given. He presently serves as secretary-treasurer of the Rocky Mountain Region and is also working on the APPA Reference Manual revisions.

Bruce Rutherford, Director of Physical Plant
Washington State University, Pullman, Washington

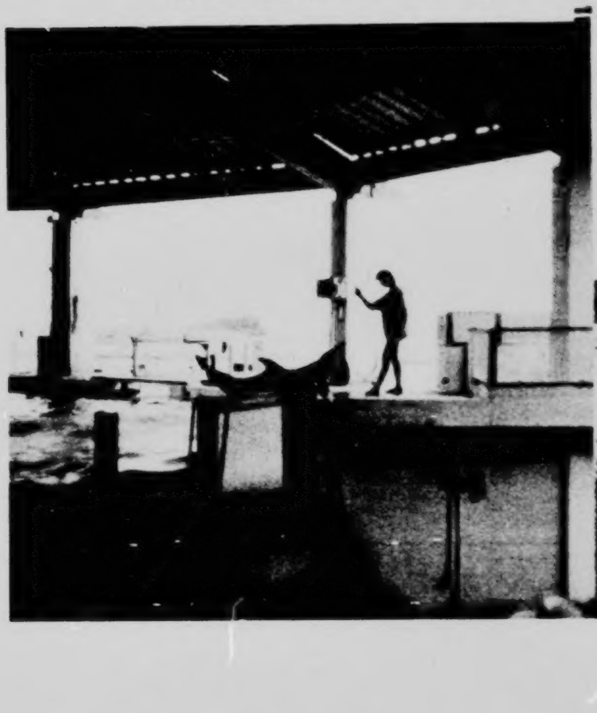
Rutherford has been the Pacific Coast Regional Representative for APPA for several years and has also served on APPA's nominating committee and other committees. Active in regional politics, he is also a past president of the Pacific Coast Region.

Gene B. Cross, Assistant Vice President-Operations and Services
University of Delaware, Newark, Delaware

Cross is APPA's vice president for professional affairs as well as a member of the Board of Directors, now completing his fourth year and second term. Previously employed as assistant to the administrative vice president and director of environmental health and safety at the University of Utah, he was active on committees of the Rocky Mountain Regional Association and is a past president of that region.



SEA LIFE PARK TOUR—This was one of the key stops of an exciting bus tour of the southern tip of Oahu that also included the Blowhole and other scenic coastal attractions. The tour concluded through an exclusive residential area accompanied by the bus driver's humorous repartee.



UNIONISM IN PHYSICAL PLANTS

Introduction by Phil Koehler (University of Hawaii)

Hawaii is unique in that all state employees are covered by a collective bargaining law and are divided into thirteen different bargaining units. Six of these units are represented at the University of Hawaii. The facilities management department is 100% unionized including me. My unit—board of regents appointees, nonfaculty—is represented by the Hawaii Government Employees Association which is affiliated with the American Federation of State, County and Municipal Employees (AFSCME) nationally. It is too early to tell how the collective bargaining law will actually work, but Hawaii has already had a breakdown in communication between teachers and the Department of Education, which resulted in closing all schools in the state—the first time such a thing has happened anywhere in the United States. Were this to happen at the University of Hawaii, there would be no one left to run the plant since everyone is unionized. However, if a grievance is filed against my department, I, although a union member, become a member of management.

With that introduction, let me welcome David Trask who will explain in greater detail how the union system works.

APPA's membership is composed of architects, engineers and maintenance directors of colleges and universities, who may think of themselves to one degree or another as employees of the university. Perhaps they see themselves as underpaid, overworked victims of a big bureaucracy. The American Federation of State, County and Municipal Employees (AFSCME), which has 600,000 members in every facet of state and local government, represents the men and women who work under physical plant supervision.

The concept of a university has been perceived in a number of ways through the ages, but those perceptions inevitably focus on the faculty or students. Eugene Victor Debs, the great turn-of-the-century socialist labor leader, perceived the university as an aristocratic institution in its relationship between the university and labor. There is an aristocratic element today on every campus—professors who seem never to be around, who spend time moonlighting as consultants and hustling off to conferences. Many legislators and taxpayers think of colleges and universities in terms of those professors.

This is not intended as an antiacademic speech, but rather an expression of concern about the state of some institutions in this country, including institutions of higher learning. It is about AFSCME and the public employee union movement and the fact that public administrators and public employees share common concerns with which they should deal.

AFSCME is made up of men and women in a wide range of employment: Sanitation workers in Memphis and lawyers and medical technicians in New York; University clerical employees in Hawaii and prison guards in Florida. For the most part it is a union that depends on voluntary participation. Unlike unions in the private sector, public employee unions rarely control access to jobs. As a result, AFSCME has 600,000 dues payers, but represents about 1¼ million workers in day-to-day matters. It is now the fifth largest affiliate of the AFL-CIO and is growing faster than any other union in the country. That growth results from several factors.

The main reason public employees are moving rapidly toward unionism is the growing insecurity and frustration they feel in their work situations. That is just as true in city and state government as it is on college and university campuses. Money is tight; the public is unwilling to pay more taxes without a demonstrable improvement in services. Institutional structures that seemed to serve purposes in the past are proving inadequate in the '70's.

By JERRY WURF and Delivered by DAVID TRASK. *The author, who was unable to present his paper in person, is the president of the American Federation of State, County and Municipal Employees. Delivering the address for him was David Trask, vice president of AFSCME and executive director of the Hawaii Government Employees Association, an affiliate of AFSCME. He is a former state senator and also a former deputy director of the State Department of Personnel.*

Public employees include employees of public and nonprofit private colleges and universities and have traditionally occupied a secondary social and economic status in this country. During the 1930's national policy encouraged establishment of unions and collective bargaining. That policy specifically excluded public employees, however.

At the same time, the federal government began paying attention to job-related problems affecting workers. Congress passed the Fair Labor Standards Act setting a minimum wage and establishing overtime guarantees for most workers. More recently, Congress passed legislation forbidding racial and sex discrimination in hiring and promotions. They also passed federal safety and health legislation to protect employees in the private sector. Every one of these laws excluded public employees. Some were amended recently to cover some or all men and women working in public services, but the absence of legal protection has made unionism more attractive to public employees the absence of law has made collective action more vital to their survival. The benign neglect of public employers throughout the nation has made it clear to public employees that if their lot is to improve, it must be through *their* initiative.

This necessarily has changed the way some physical plants operate. Public employee unionism means an end to patrimony, characterizing labor-management relations in government, colleges and universities. It should mean an end to some bureaucratic "buck-passing" often a convenient device for maintaining the status quo.

AFSCME members want a voice in decisions that affect their well-being. They do not want to run colleges and universities, nor to decide where buildings will be built or which ones will be air conditioned. They do want to be heard on questions affecting workers on a day-to-day basis on wages, hours and working conditions.

Occasionally, this will prove inconvenient to physical plant administrators and others in management positions. There may be conflict, but they want to do all they can to prevent impasses from developing and to resolve them peacefully when they occur. The union does not claim that the collective bargaining process is always a neat, easy way to resolve labor-management questions, but in our society it is the only way a worker can be heard. It is the only way his grievances will be considered by management.

There is much said about worker alienation, the so-called "Blue Collar Blues," most of which is nonsense. There is a tendency, however, for a worker to want a voice about his work, and the union gives him that voice. Once a job was regarded as a precious thing. The Depression had its impact on two generations of Americans those directly affected by it as workers, and those whose mothers and fathers were affected. It made people want steady, reliable jobs and to cling to them no matter how boring or unrewarding. President Nixon likes to talk about the "work ethic," as though Americans had somehow grown soft and indolent. That is not true. American workers today are as productive, honest and capable as workers in any other era in the country's history.

Today's society *is* different, however. It has seen the beginning of a revolution a peaceful revolution but one that will not be denied. Twenty-five years ago there were restaurants and public places where black people were not served in New York City, not just in the Deep South. There were jobs in New York City government understood to be white jobs, and other known to be black. Many equally blatant forms of job discrimination exist on campuses today. A man pushes a broom through a classroom building and is called a custodian and is payed $3 an hour. A woman pushes a broom through a dormitory and is called a maid and is paid $2 an hour.

In New York, black and white workers figured as long as they were subject to manipulation and exploitation on the basis of race, they would *both* be victimized. They came together into a union and made it clear to New York City management that a new era had arrived. Today AFSCME has 100,000 members in New York City.

Workers on university campuses have been slower to rise up. Like most institutions, unions have been and are male dominated. They have been slow to react to demands for equity from women workers. AFSCME has concluded that as long as employers discriminate against workers on the basis of sex, they maintain a dual system harmful to men *and* women workers. It is for all its members that AFSCME presses colleges and universities to end employment practices discriminating on the basis of sex. It will press for affirmative action to remedy existing injustices.

The revolution says racial discrimination will not be tolerated. It says that women are equal to men in the work place. It is a revolution that says the worker, not merely the employer should have a say in decisions affecting his life. That shared responsibility is called bilateralism. It means that before a worker's job situation is changed, the worker is consulted. The extent to which the worker is consulted is a product of the relationship existing between the administration and the worker's representative, his union. They bargain over rewards and degree of participation workers will have. This is dignity and democracy on the job.

Wages, hours and working conditions are the foremost concerns. Another is the preservation of social and governmental institutions in this country. As public employees they have a vested interest in the survival of government. As taxpayers and consumers of public services, they have an interest in good government that is even more compelling.

They want decent schools because their children rely on public schools. They want better and cheaper housing, because they cannot always afford decent housing. They want a stable national economy, because as long as food costs and interest rates and everything else keep going up, it makes no difference what kind of wage increases are negotiated. They want a better tax system, because they are tired of "paying through the nose" for declining services. They feel victimized because the tax system is a crazy patchwork system that lets millionaires off "scot free." It lets developers rely on city services, state incentives and federal loan guarantees to assure huge profits. Then it lets them invest those profits overseas or put them in tax shelters, so there is no return to the public treasury.

Someone has to pay, and the burden falls hardest on middle-income and low-income working families. They pay through sales taxes that hit the $12,000-a-year family at a much higher level than the $100,000-a-year family. They pay through regressive state income taxes. They pay into a Social Security Trust Fund shockingly stacked against lower income workers, and through a federal tax system full of loopholes and gimmicks for the wealthy.

Taxpayers are angry and have a right to be. Too often that anger is channeled into attacks on public services at the nearest level. It is easier to lash out at the garbageman or curse the spendthrifts at the state university than to understand the nature of the revenue-raising procedures.

Taxes are uninteresting; a legislator can benefit from a speech attacking student radicalism or the spending policies of a state university. He can point to marble "palaces" on campuses, to professors drawing high salaries for a few hours in the classroom. He can talk about the affluence of students, administrators and staff. Those speeches will win votes and applause. A knowledgeable speech on taxes comes much harder, but that is where the trouble lies.

APPA is less radical than AFSCME. Today there is a *need* for activism, individually and collectively, among people like APPA's members. There is a need for bilateralism in labor-management relations. Labor and management should bargain together, on the same side of the table, in Washington and in state capitols. They should work together for common interests—in the cause of good government, viable institutions and livable communities.

Public institutions are under fire today. Demands for service are enormous and revenues are limited. If the Nixon administration prevails in its budget proposals, the pressure will increase. Faith in the system is absent, and that faith cannot be restored with rhetoric and slogans. It can only be restored through planning and administration leading to demonstrable change. People want to see results.

As a union AFSCME is here to stay. If it is not on a campus now, it probably will be soon. Administrators have demonstrated they can cope with it. The union will continue to push for equity in relationships on campus, and at the same time for solutions to problems confronting the system of government as a whole.

QUESTIONS AND ANSWERS

Question: How does the grievance procedure work under the Hawaiian union setup?

Answer: The union is divided into units of which administrative, professional and technical groups are represented at the University of Hawaii. The administrative unit has about 500 people and about 3,000 faculty members comprise another unit. Recent collective bargaining agreements may cause a little discomfort for administrative and faculty units in that faculty will not only have to deal with the board of regents, but also with the union. The impact will be great once the procedure is fully implemented. As the president of the union I speak for and on behalf of union members in my unit. For example: The University of Hawaii recently fired the basketball coach who is a member of my unit. When he was hired, no members of the unit were represented on the hiring committee, which was comprised mostly of faculty. I demanded that our unit be represented on future hiring committees for jobs in our unit without interference from faculty. With this resolved, now our own people will say whether a person should be fired or not.

Question: How are professional engineers represented in the union?

Answer: In Hawaii a professional engineer (except those at the University of Hawaii) belong to a professional unit, which is not much different from a professional engineering association. After all, what is a bar association but a union of lawyers? A manager makes decisions, and because he is a union member doesn't mean necessarily that he changes. He doesn't become a different man the day he pays his dues. He doesn't make decisions to benefit the union—he makes decisions based on his duties and responsibilities as a professional in a particular position.

Question: Are you trying to "sell" the idea of a union to us?

Answer: I am not trying to convince you that you ought to belong to a union. I am here to tell you how the law works in Hawaii and what unionism is. My message is that union members work under you, and that whether or not you are unionized, your counterpart in Hawaii is—and the system here is *working.*

Question: With whom does the union negotiate? If all employees at the University of Hawaii are unionized, how are funds, for instance, divided up?

Answer: The University employs what are called "excluded people," who do not belong to any union group. There are about 100 of the top administrators at the University who are "excluded." The state legislature has the final say about funding, however. For example: The union may want pay increases of 5½% in February, another 7½% in July with one of 6% in July of next year and another 6% in 1975. After discussing it with the individual departments involved, the union takes its demands to the legislature which either accepts or rejects them. The legislature has no power to change the demands—only to accept or reject. The governor's representative is the chairman of the negotiating committee in the legislature; the amount of money allotted to the governor's budget will finally tell whether demands will be met.

Question: What happens if the legislature rejects the demands?

Answer: Strike. We are probably going to have to strike in September of the next election year. There is nothing else to do. Since we haven't had a salary increase since 1969 the legislature is in the mood this year to allow an increase. The next time around, however, the legislature may not be in the same kind of mood, so we will strike to maintain benefits and move on to better things. You must also remember that Hawaii is unique in that it's not possible to pick up your family and move to the next state if you are dissatisfied with a bargaining agreement. As a responsible union leader it is my job to see that this does not happen. Salary increases will be more and more difficult to negotiate in the future, and the union will be looking to other benefits and working conditions for improvement.

Question: The legislature only has so much money available, and actions such as striking are the kind of thing that bother lawmakers as administrators and as taxpayers themselves. I can't see where this whole union movement is heading right now.

Answer: There is a different kind of union leader around today. They are college graduates, as are all the members of my union. The deputy director of the union is only 28 years old. The fiscal expert has a masters degree from the University of Kansas, and we have a journalist from the Northwestern University School of Journalism. There is a full spectrum of ideas eminating from this group, and union leadership is changing. I live in Hawaii 6,000 miles from Washington, I know Hawaii and how to take care of it; let union leaders in Washington take care of Washington. For example: I told my members that if there was no money coming out of the state, there would be layoffs unless everyone took percentage cuts. I thought that in time of need we should take the loss together, as we all benefit when the market is good.

Question: Would you comment on whether you are concerned about management problems in dealing with people under a program with very discouraging procedures for disciplinary action leading to termination? As a union leader are you concerned with the operational problems and discouragment management faces at being unable to terminate employment of noncontributing employees?

Answer: It is the union leader's responsibility to discipline workers against whom such complaints are raised. The problem in such cases is usually economic or personal. Our union has a strong disciplinary action system, and I hope that other unions are developing the same.

PATTON PLAN FOR FIRE SAFETY APPLIED TO UNIVERSITIES

The existing fire safety plan in structures is based on the "fireproof building" theory of fire protection. It presumes that human life is safe in a steel and concrete building resistant to the ravages of fire. However, this assumption is false! The high cost of fireproofing steel is justified only if it is possible that a long-duration interior fire will occur within the structure.

"Proofing" the building against fire means that the structural steel has been encased in fireproofing material having heat insulating qualities. Building a cocoon of heat insulating materials around the steel guarantees the *structure* will withstand an interior fire of a given duration.

"Class A" fireproof buildings have the steel protected to withstand the intense heat of a four-hour fire. Class A fireproof buildings are ones in which designers expect a four-hour interior fire to occur, and therefore the building is proofed against this fire. All this is done on the basis of standard fire tests conducted at Underwriters Laboratories during which gas flames produce a 2500°F exposure to structural members tested. Essentially, the fireproof buildings must have the same features as a furnace; it must withstand an interior fire without being destroyed.

The interesting thing about this traditional plan for human fire safety is that it protects the building, but not the people. It does not protect the people because they are inside the "furnace". People are just as safe in a fireproof building when the contents are burning as they would be inside a furnace when fuel is burning.

In short, the present plan for fire safety for humans applied in the U.S. is an absurdity. The reason people die in burning buildings is that fire safety plans are directed toward *protecting the structure*–not the people.

Content Fires

When a fireproof building is constructed it is safe for humans. As long as it is empty it is safe because there are no flammable contents. Unfortunately for fire safety, people do not leave buildings empty. When combustible furnishings are brought into the building, and there is fuel in the "furnace", the fireproof building thus ceases to be safe for humans.

There is evidence to indicate that more than 90% of people who die in building fires are killed by burning contents and are dead before the structure itself becomes involved in the fire.

Flashover

Flashover is a phenomenon occurring in building fires. When a fire starts in the combustible contents of a room heat is trapped and contained by the fireproof structure just as a furnace contains the heat inside the firebox.

When a fire occurs in one part of a room, i.e. a sofa, the heat from this fire is trapped within the room and other furnishings are heated by the fire. Suddenly, fire will flash from the point of origin, the sofa, to other combustibles in the room. This is flashover.

Once flashover occurs the room of fire origin acts like a miniature atomic bomb. Within 60 to 120 seconds after flashover the fire can spread over a wide area and kill many people. Before flashover, no one may be aware the fire exists. After flashover, everyone may be dead before they know what has happened.

Fire is so deadly, because it is sneaky. Undetected it can build slowly. When small, it does not really seem dangerous. Suddenly, a fantastic change takes place. A small fire literally explodes into an inferno. Once this happens, death can be instantaneous.

By **RICHARD M. PATTON**. *The author is the president of Patton Fire Protection and Research, Inc., Tucson, Arizona.*

Patton Plan For Fire Safety

The traditional fire safety plan (based on the fireproof building) ignores interior fire and the flashover phenomenon.

The traditional plan for fire safety is predicated on the assumption that the structure itself determines fire hazard. This plan holds that structural regulations are the key to a safe environment.

The Patton Plan holds the opposite. It contends that interior furnishings—not structure—counts. While the traditional fire safety plan protects the building, the Patton Plan protects the people inside of the building.

The traditional plan assumes there will be a long-duration interior fire, and that the structure must be designed to withstand this fire. The Patton Plan contends that a long-duration interior fire is intolerable and should not be permitted.

The Patton Plan detects and suppresses interior fires automatically, thus preventing flashover from occurring. If the structure is protected the occupants are not necessarily because people are more vulnerable than the structure.

However, by protecting the people, the structure is automatically protected. Since people are damaged before the structure, preventing conditions hazardous to people automatically prevents conditions hazardous to the structure.

The Patton Plan guards against fires involving interior furnishings and contents. Content fires must be detected early and be stopped. This is the heart of the fire safety Patton Plan.

Patton Life Safety System

The National Fire Protection Association publishes the Life Safety (building) Code. This code establishes structural regulations presumably safe to people occupying the structure and represents the traditional structure-oriented fire safety plan.

The Patton Life Safety System is designed to protect the occupants through an advance sprinkler system design. Modernizing the sprinkler system and directing it toward protecting people rather than property represents a forward step in fire technology. Further improvements to the system were devised: an electronic detection and supervisory system; automatic signal to the fire department; and better manual fire fighting tools.

The issue is that this plan saves people and structures, whereas the "fireproof building" theory saves buildings, and often sacrifices human life.

Architectural Ramifications

The shift in fire technology from structure orientation to people orientation will cause the most significant change in architecture in this century.

Presently, approximately 60% of the building codes are fire safety regulations. Of all factors affecting the design of a structure, fire safety is primary.

Architects design buildings first to meet fire codes, secondly to meet human needs. In applying their professional skills architects perform within the confines of a complex set of structural regulations. Because the architect has always been confined, he accepts this normally. His vision is restricted by the parameters of controls. The architect cannot visualize buildings he *could* build any more than fish could visualize life out of water. The environment is totally different, and the human mind working in one environment does not visualize within the framework of a different one.

Eventually the Patton Plan for Fire Safety will void building regulations as known today. Architects will find that controls they have accepted all their professional lives are gone.

In this new environment most architects will flounder like fish on dry land. A few will develop new skills and establish a base for a renaissance in architecture.

New Building Materials

Today, the plastics and chemical industries create synthetic materials with the potential to revolutionize construction. Within the past year five separate firms have planned homes constructed of plastics. Several visualized molding the structures as plastic toys are molded.

Fire regulations, however, act as a deterrent to most of these plans. Underwriters Laboratories in Chicago and the National Bureau of Standards in Washington put these plastics in a furnace and say they burn too fast and produce too much smoke. They base these restrictions on *old* fire safety theories which contend the structure sets fire safety parameters.

The Patton theory holds that the structure is secondary, and that combustible contents are the prime threat to human life. By adequately controlling interior fires and intercepting them before they involve the structure, even structures of molded plastics are fire safe—not by fireproofing the structure, but by fireproofing the occupants.

Existing Buildings

Building codes constantly change because fire experts still try to write codes defining inherently safe or "fireproof" buildings, which is impossible.

Each new regulation convinces the uninformed that "old" buildings are "unsafe" buildings. Why? For no other reason than that the codes have changed.

Consequently, probably every major university in the United States is under pressure to tear down its hallowed buildings. The Patton theory states that age and construction are irrelevant to fire safety. Old buildings can be safe, and new buildings, unsafe. The heart of the matter is whether systems have been installed to control the interior fire before it endangers occupants.

Patton Theory Applied To Universities

Modern universities are small cities. Many have their own power and water supplies, police force, fire department, and engineering and maintenance departments.

Building types and services include the following: apartment, dormitory, restaurant, hospital, printing plant, movie house, theatre, sports stadium, gymnasium, library, machine room, machine shop, woodworking plant, storage facility, laboratory, classrooms and facilities for a variety of other activities.

Each of these operations represents a fire protection problem. Every building is subject to building codes. As previously mentioned, 60% of building code requirements will address the fire problem.

When fire-oriented building construction costs are totaled they usually represent at least 20% of the total cost of new construction. Added to this is the cost of special water supply, fire department services and facilities, emergency power and lighting, and other fire-related costs; therefore, fire protection represents one of the major costs of any university.

Changing fire technology to produce major reductions in costs or major improvements in human safety should be important to university management. Shifting fire safety emphasis from structural regulations to fire control systems will reduce not only building costs but also increase flexibility of structures.

Since many universities have architectural divisions, the Patton Plan of Fire Safety offers the opportunity to create new construction forms and building types not locked into existing building codes. If fire safety is independent of structural system this opens up the building design field to a creative new world.

In the future, when the Patton Fire Safety Plan is fully implemented, there will be no boundaries to the university cities that can be created, except those that exist in the mind of the creator.

ALOHA RECEPTION—Hosted by the Pacific Coast Regional Association of APPA, this gala opening of convention festivities provided members, guests, exhibitors and their families with an opportunity to greet new and old friends. They also made their first acquaintance with Hawaiian pupus (hors d'oeuvres to the mainlanders) and the delightful Facilities Management Troupe, a talented Hawaiian ensemble that entertained frequently throughout the convention. Members took turns accompanying them on the washtub bass.

AIR CONDITIONING WATER TREATMENT - SAVINGS AND TECHNIQUES

Inefficiency and downtime of commercial air conditioning systems often result from loss of heat transfer efficiency in the refrigeration systems caused by waterside corrosion, scaling and fouling. Good water treatment programs provide the necessary protection. Soundly engineered, such programs actually lower power and maintenance costs and increase equipment life and efficiency. The programs are designed to meet individual needs based on makeup water source, operating parameters and applicable water discharge standards.

Air Conditioning Market

The high living standards of today's society include comfort in all facets of daily life—home, car, office and school. Evidence of this is the high percentage of air conditioning units specified in current construction projects. Technically advanced systems are going into many new units to assure lower manpower and operating costs for the systems. Such systems have critical standards of heat transfer efficiency and control of water conditions and include automatic temperature, humidity and ventilation controls.

In many cases schools now include such air conditioning systems in their design, and they represent 31.7 percent of the estimated installed market with advanced controls as of June, 1971. A high percentage of these systems in educational facilities suggests strongly that installations are going not only into new construction, but also into existing facilities.

The concept of school air conditioning has been most rapidly adopted in affluent suburbs with up to 85 percent of such schools having full air conditioning. Adding impetus is a growing trend toward year-round schooling as the answer to future educational needs Fifty-five percent of new secondary schools and more than 86 percent of new university buildings are constructed with full air conditioning capacity.

Budget Considerations

Steadily increasing operating costs of central air conditioning have prompted interest in controlling expenses considered variable. One way to achieve this is through selection of a well-engineered water treatment program. An obvious corollary to this is selecting a supplier of such programs with the necessary experience, products and technical skills.

Six major cost factors directly influencing operation of commercial and industrial air conditioning systems are:

a. Capital
b. Power
c. Operating labor
d. Maintenance
e. Water
f. Chemical

a. Capital

For satisfactory air conditioning of plants of most colleges, capital costs may exceed $1 million. Refrigeration loads can vary from 2,000 to 15,000 tons capacity, and initial costs may run from $500 to $1000 per ton of capacity. Much of this cost is for water handling equipment (cooling towers, condensers, chillers and piping) and is a major investment worth protecting. Depending on size and metallurgy, a condenser tube bundle may cost anywhere from $30,000 to $100,000 to replace. Good water conditioning can usually avoid such expenses.

Frequently, air conditioning systems are designed with ample fouling factors and may include standby equipment to prevent system downtime if serious problems arise. Careful advance planning of a system includes good water treatment as part of the projected operation, thus precluding need for the capital costs of standby equipment.

By LOUIS B. ASTBURY. *The author is district manager (Indiana) of Betz Laboratories, Inc., Somerton Road, Trevose, Pennsylvania 19047, producers of specialty chemicals with engineering services for water and process systems.*

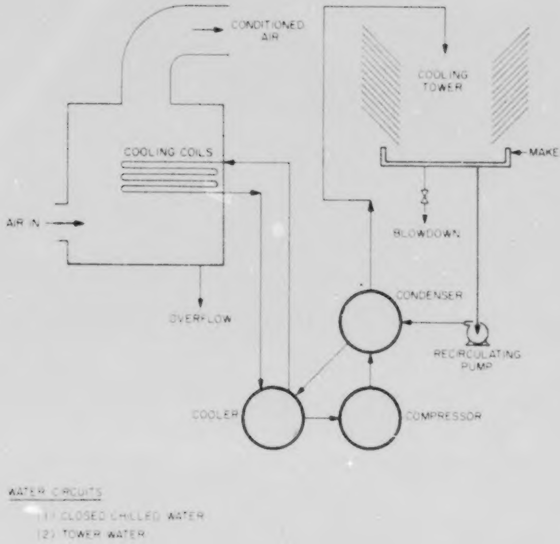
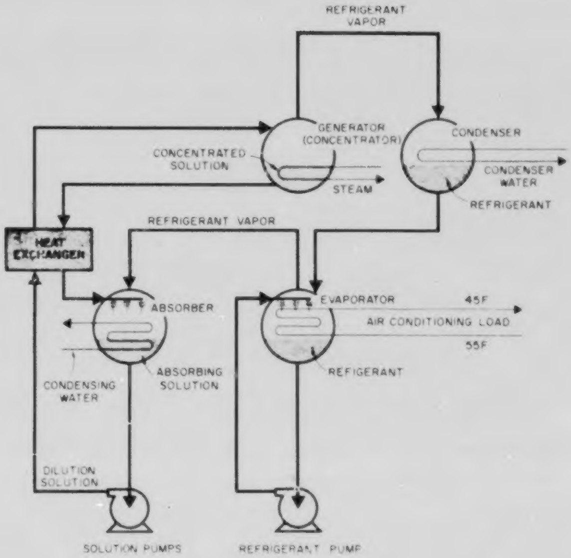

CONDITIONED AIR
COOLING TOWER
COOLING COILS
MAKEUP
AIR IN
BLOWDOWN
OVERFLOW
CONDENSER
RECIRCULATING PUMP
COOLER
COMPRESSOR
WATER CIRCUITS
(1) CLOSED CHILLED WATER
(2) TOWER WATER

Diagram shows typical centrifugal unit using cooling tower water as the condensing medium.


REFRIGERANT VAPOR
GENERATOR (CONCENTRATOR)
CONDENSER
CONCENTRATED SOLUTION
STEAM
CONDENSER WATER
REFRIGERANT
REFRIGERANT VAPOR
HEAT EXCHANGER
ABSORBER
EVAPORATOR
45F
AIR CONDITIONING LOAD
55F
CONDENSING WATER
ABSORBING SOLUTION
REFIGERANT
DILUTION SOLUTION
SOLUTION PUMPS
REFRIGERANT PUMP

Schematic drawing of absorption refrigeration system.

The size of capital investment depends not only on capacity, but also on such design criteria as type of refrigeration, available resources, and whether the system is centralized or decentralized. With the centralized system, there is one power station comprising a few turbine-driven compressor units and/or absorption systems. In decentralized systems, many relatively small (200-500 ton) refrigeration units may be spread over the campus. Both types are widely used in U.S. educational installations.

Of the three types of air conditioning systems available (centrifugal refrigeration, absorption units and reciprocating compressors) only the first two will be discussed, since the third is usually limited to 200 tons.

A centrifugal unit consists of a compressor, a cooler and a condenser. The centrifugal drive may be an electric motor, steam turbine or gas engine. The unit is compact, reliable, quiet, and offers long life, low maintenance and easy operation. The cooler is usually a shell-and-tube heat exchanger. A refrigerant such as Freon 12 or Freon 22 circulates on the shell side. Water circulates through a closed loop on the tube side. The condenser is also a shell-and-tube exchanger, with water as the condensing medium.

Cooling tower circulation is normally 3 gallons per minute per ton (3 gpm/ton) of air conditioning. Water in the condenser requires careful treatment, since it is in open circulation and gets saturated with oxygen, causing corrosion on metal surfaces. Water in a closed loop is easier to control.

Absorption chilling systems for commercial air conditioning are also effective and economical. Such systems use steam from heating boilers that are normally idling, and are compact, quiet, and efficient. They will function on either low-pressure steam or hot water.

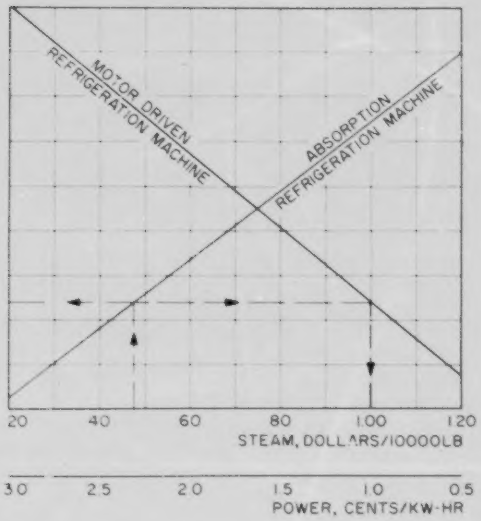
A typical rating for absorption equipment is 12 psig dry saturated steam supply at 245F. For a system using hot water, if the water enters at 270F and leaves at 230F, the capacity of such an absorption unit is approximately the same as the steam-operated unit.

The basic difference between an absorption and a centrifugal system is the refrigerant. An absorption unit uses water, cooling it by evaporation, rather than compressing its "refrigerant." Water is vaporized and absorbed by a salt solution such as lithium bromide. Steam boils off excess water from the salt solution, returning the solution to its original strength so it can absorb more water vapor, thus keeping the cycle continuous.

The four main segments of the absorption cycle show the absorber and evaporator performing the actual chilling while the generator and condenser complete the continuous operation. For heat dissipation, condensing water gets circulated over a cooling tower. Necessary flow for such systems is 6 gpm/ton of air conditioning load.

Absorption refrigeration systems are a practical choice when any of the following conditions exist:

1. Low cost fuel is available to generate steam;
2. Electricity rates are high;
3. Low pressure heating capacity is not in use during the period when the cooling system is in operation;



Graph illustrates operating cost benefits for centrifugal and absorption units.

4. Waste steam is available.

A good estimate is: If the cost of steam in dollars per thousand pounds is under 50 times the cost of electricity in dollars per Kw, anticipate lower operating costs for an absorption unit.

b. Power

Power costs for a refrigeration machine may be calculated as:

$$\text{POWER COST} = \frac{\text{bhp x hr cost/Kw hr x .746}}{\text{Motor efficiency (\%)}}$$

bhp = brake horsepower
.746 = conversion factor from Kw to bhp

The equation shows power costs will rise when any factor on the other side of the equation varies. If motor efficiency drops or horsepower requirements rise, power costs rise. Obviously any change in the heat transfer coefficient of the system will cause unfavorable changes in the equation. Fouling correlates directly to heat transfer, as does scale buildup, both reducing heat transfer efficiency. To offset fouling, more heat transfer surface is required.

Most systems are designed with a built-in tolerance factor for expected fouling. Planning for a proper water treatment program in system design and lowering this tolerance factor can reduce construction costs.

With a sound water treatment program, a safe fouling factor is normally 0.0005 to 0.001. This factor is an expression of hours times square feet times degrees of temperature difference divided by Btu's. Without treatment the factor can reach 0.003 or 0.005. This may increase horsepower requirements by as much as 30 to 50 percent. Using the equation and chart below, the result is an increase in power costs.

$$\text{FOULING FACTOR} = \frac{\text{hrs.} \bullet \text{sq. ft.} \bullet \Delta T}{\text{Btu}}$$

Fouling Factor (hr.) (sq. ft.) (deg. F temp. diff.)/BTU	Overall Heat Transfer coefficient (hr.) (sq. ft.) (deg. F. temp. diff.)/BTU	Thickness of scale (inches)	Increase of required heat transfer (%) surface
CLEAN TUBES	850	.000	0
0.0005	595	.006	45
0.001	460	.012	85
0.002	315	.024	170
0.003	240	.036	250

c. Labor

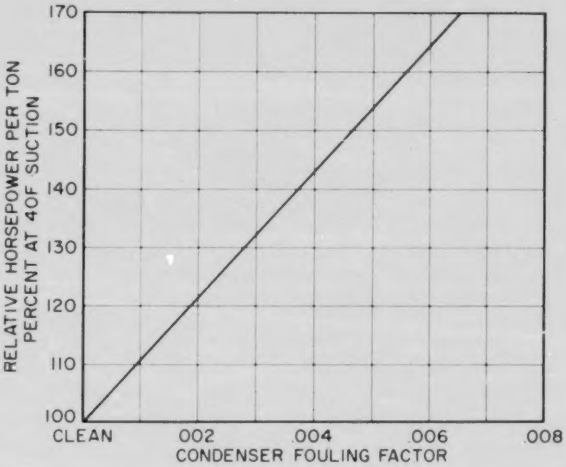
Labor costs must depend not only on the size of the physical plant and the number of units, but also on how many actual physical functions must be performed by operating engineers and other staff personnel.

Decentralized systems have more equipment to be serviced, which means their labor costs are higher than the man-hours required to service equivalent tonnage of centralized equipment. Using dry chemicals in water treatment may increase labor costs because of need for testing, control, blending and feeding of the products. Labor costs can be lowered by using liquid products which combine active ingredients for corrosion and scale protection in single formulations, and which are fed on a continuous basis with reliable low-capacity pumps giving the system optimum protection.

The success of a water treating program depends on maintaining good chemical balances in the system. To achieve this may require manual testing daily for inhibitor analyses and up to 3 pH determinations daily. Testing frequency will be determined by circulating water characteristics and by adherance to program parameters. The growing use of deposit control agents for calcium scale control and fouling has made it possible to relax many system parameters to some degree.

Time needed for feeding, testing and control adjustments favors central systems over decentralized ones. Central units are also more easily and economically automated. Using equipment designed specifically for the purpose, inhibitor feed can be held within ± 0.1 units, and blowdown can be controlled with a predetermined conductance level. Alarms guard against acid overfeeding through an interlock stage based on corrosivity measurement.

Graph indicates relative increase in horsepower per ton vs. condenser fouling factor.



These controls can greatly reduce manual testing and control time and free operating personnel for other responsibilities. Actual testing done by personnel may be reduced to once per week, and good quality equipment calls for only routine maintenance of the electrodes–less than 5 minutes weekly. Thus automation cuts manual labor to a minimum, a fraction of that required with manual control. For progressive plants with increasing automation, liquid products, amenable to automatic control, are ideal.

d. Maintenance

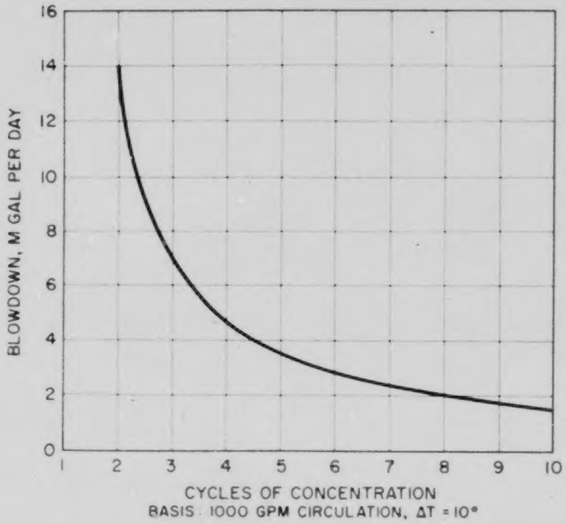
Such routine maintenance as testing and applying chemical treatment is a normal part of the budget. Extra manual labor can send a maintenance budget soaring, and manual cleaning or acidizing condensers required because of lack of good water treatment is very expensive and time-consuming. Usually it means lost service time for the unit. In addition, acidizing the tubes causes some metal damage and contributes to shorter equipment life.

With poor waterside fouling control, air conditioning units may have as many as two or three unscheduled shutdowns a year. Aside from labor and expenses, such shutdowns invariably elicit complaints from students and faculty. A properly engineered program controls scaling and corrosion tendencies in the circulating water and provides protection against corrosion of 90 percent or more. Two to three years of operation can be expected before any shutdown is needed. Then, only water flushing may be needed after thorough equipment inspection.

Control is more effective with automated systems. A computer testing laboratory initiated a water treatment program after numerous shutdowns caused by waterside problems. Control problems still existed, but tube drilling was no longer required. In 1967, the firm began evaluating a completely automated cooling water treatment program, gradually expanding it to include 13 installations with capacities averaging 400 to 500 tons.

Results obtained are as follows:

1. The first heat exchanger, opened after 2 1/2 years, showed no scale. Tubes were simply flushed with a hose and returned to service.



Graph shows proper cooling water treatment results in higher cycles and lower blowdown rate. Therefore, less wastewater must be treated or discharged.

2. No downtime due to scale or corrosion occurred in any of the 13 units.
3. Corrosion rates, verified by coupons, were less than 3 mpy with a nonchromate inhibitor program.
4. Water consumption dropped 50 percent.
5. Water treatment chemical use dropped 30 percent.
6. Man-hours dropped 50 percent.
7. Maintenance on the waterside fell by 80 percent.
8. Automation equipment (including installation) showed a 20-month payout.

While not every installation of automated equipment realizes as many high dividends in economy and labor, it is obvious that such equipment offers enough attractive advantages to merit serious consideration in sizable installations.

e. Water

Increased control over discharges by environmental legislation has raised the cost of discharging water near the average charge for cooling tower makeup. Assuming a cost of 25¢/1000 gallons of water, a savings in water cost can relate directly to lower operating costs.

Water consumption is directly related to circulation rate, temperature range across the cooling tower (ΔT), evaporation rate and cycles of water-soluble mineral concentration. The relationships are as follows:

(1) Evaporation = Circulation x 1% per 10F ΔT

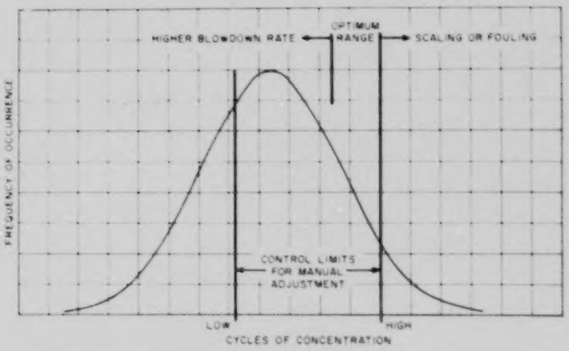
(2) $$\text{Blowdown (plus windage)} = \frac{\text{Evaporation}}{\text{Cycles of concentration} - 1}$$

(3) Makeup = Evaporation + Blowdown

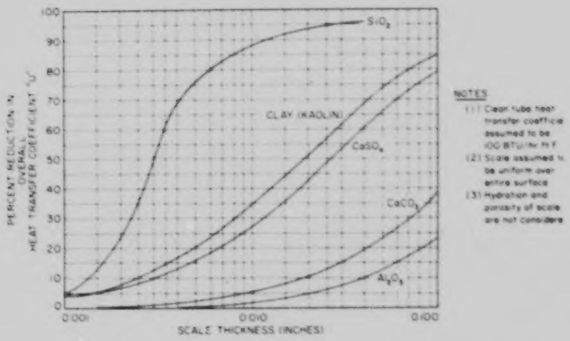
This relationship shows that a tower system operating at higher cycles of concentration means economic benefit. Only a good treatment program can achieve higher cycles and lowered blowdown rate and still prevent scale and corrosion. The amount of money saved will be directly proportional to the size of the water system. With the big air conditioning tonnages found in large modern universities, this could mean water savings could approach $100 daily with good control over cycles of concentration.

It is important to recognize that automation can do more than take over the manual work of feeding and controlling treatment. It will also improve control of cycles, and control blowdown in the optimum range to prevent fouling and water waste. Both factors result in more economical operation. Betz conducted a survey of cooling systems, plotting statistically the frequency with which cycles of concentration stayed either within suggested manual control limits or within the optimum (narrower) range possible with automatic control systems.

That analysis reveals that if automatic control is used to maintain blowdown in the optimum range, it can be reduced by 29 percent in an average plant. For example, if maximum permissible cycles are 4.0 and a set-point of 3.8 is used, control remained within 3.6 -4.0 cycles.



Graph illustrates frequency of cooling water blowdown test results expressed as cycles of concentration.



Graph shows how cooling water operating parameters relate percent reduction in the overall heat transfer coefficient "U" to scale thickness.

f. Chemical

Chemical feed is proportional to blowdown rate. The 29 percent blowdown reduction quoted above results in a corresponding savings in chemical treatment if residual rates are not altered. Similarly, a narrower range of inhibitor level can be held with automatic control equipment than by manual adjustments.

Poor chemical control, with feed rates swinging above or below the recommended range, wastes money. Higher dosages simply mean more treatment chemicals get discharged with blowdown; lower dosages than the required minimum mean the system lacks the required protection against corrosion and scale, causing possible damage to equipment, loss of heat transfer, and possible downtime.

Modern Cooling Water Treatment Technology

Closed Systems

Closed systems are normally not subject to scale except where abnormal water makeup with scaling tendencies is used and goes to a hot water system. This would call for zeolite softening of makeup water.

Theoretically, the corrosion potential in closed water systems is not high, since oxygen introduced with the initial fill of water soon depletes, the oxygen expending itself in attacking system metals. However, many systems actually have sufficient water losses and air leakages to justify the cost of protective treatment.

Chromate and nitrite-based inhibitors are commonly used to treat closed cooling water systems. Buffered chromates in the 500-1000 ppm range are effective in waters with low corrosion potential, where galvanic corrosion tendencies are not encountered. Higher treatment levels are needed where high dissolved solids are present, or bimetallic couples, such as steel and copper.

A disadvantage of chromate is that in high concentrates it tends to shorten the life of mechanical pump seals. Where the system has pumps with mechanical seals, lower chromate concentrates must be used – in the 200-300 ppm range – low enough that it will not affect seal life. Chromates are also incompatible with glycol antifreezes, and can only be used with methyl alcohol antifreeze under elevated pH conditions. The usual procedure under such circumstances is to go to nonchromate. Another disadvantage of chromates is that environmental effluent standards in many areas permit chromates only at very low levels in discharge, if at all.

Fortunately, water treatment technology has progressed rapidly enough to provide alternatives. Nitrite-based materials are now frequently substituted for chromates to control and inhibit corrosion. They work well in alkaline environments. To protect couples of steel with aluminum, copper and copper bearing alloys, silicates and nitrates are often added to the nitrites to achieve the extra necessary protection.

Open Recirculating Systems

As mentioned, open recirculating cooling water is more difficult to control because cycling through the open tower causes a growing concentration of dissolved and suspended solids, along with oxygen picked up from atmosphere. A cooling tower functions very much like a giant air washer. Where the water in an air washer is intended to scrub contaminants out of the air and carry them off, the tower goes through the same procedure, but with the purpose of cooling the water through evaporation. However, the process still picks up contamination along the way, and the water requires more effective treatment.

For many years, a good cooling water conditioning program called for maintenance of 300-500 ppm of chromate for good corrosion control, pH in the 6.0 - 6.8 range for scale control and an occasional biocide to control microbiological fouling. It was found that adding a few ppm of polyphosphate dropped chromate levels to under 100 ppm. Adding zinc made it possible to drop the chromate to its present-day levels of 20-30 ppm.

However, pollution control legislation requires chromate levels to drop still lower, and, in some cases, even to be eliminated. A few areas also have rigid regulations against the use of zinc and polyphosphate. The pressures of such legislation have stimulated the development of new types of system protection, such as:

a. Deposit control programs
b. Ultralow chromate programs
c. Nonchromate programs
d. Microbiological programs

a. Deposit Control Programs

These represent a tremendous advance in treatment technology. While pollution legislation helped stimulate these advances, the dominating pressure was economics, for properly engineered programs provide cleaner systems, improved heat transfer and longer service.

Now there are specific deposit control agents to control virtually any type of deposit normally occurring in systems. Calcium carbonate, iron, silt, aluminum, various types of oils—each can be controlled by a specific agent. Alone or in various combinations, they are highly effective and thus economically attractive.

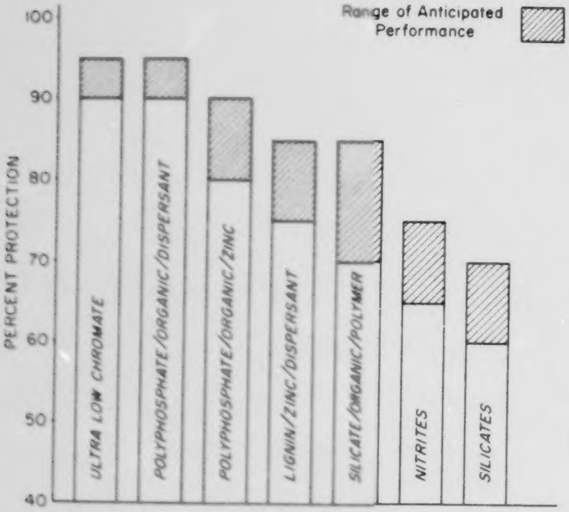
The function of deposit control agents is complex, but they are believed to function by adsorbing on the surfaces of ions or colloidal particles in the water. Proprietary products usually include colloidal surface modifiers and rate control agents as well, thus enhancing the activity of primary and/or secondary adsorbents. The pH is normally not adjusted to extend solubility of potential precipitants in the water. Instead, particle size of the potential foulant is kept in the low-growth range and in suspension, until it leaves the system via normal blowdown. This control of particle size is referred to as rate control.

A practical example of its usefulness is its elimination of sulfuric acid by a new organic phosphonate in controlling calcium carbonate deposition in cooling tower systems. Normally, sulfuric acid would control pH at a level of 6.0 to 6.8. Using a rate control product, acid is either reduced or eliminated, and the system operates in a 7.5 to 9.0 range. The water may be supersaturated with calcium carbonate, but no deposition occurs. The reason is that particle size of the calcium carbonate is kept small enough to enable it to remain in suspension instead of large enough to precipitate onto metal surfaces forming scale.

In addition to eliminating sulfuric acid, another benefit of operating at the higher pH level is a lower corrosion load on the system. With reduced corrosion potential, it became possible to protect against corrosion with an ultralow chromate treatment.

b. Ultralow Chromate Program

The level of an ultralow chromate program is approximately 5 - 10 ppm with pH at 8.0 or above. A selected rate control agent regulates calcium carbonate at an application rate of about 30 ppm. Evaluations of this treatment have revealed corrosion controlled at rates of under 2 mpy. However mild steel must be pretreated for such a program to prevent pitting and tuberculation. Growing stringent legislation on effluent standards is turning more attention to programs requiring no chromate at all.



Cross-hatching shows range of anticipated performance of ultralow chromate and nonchromate water treatment programs.

c. Nonchromate Treatment Programs

Polymers and phosphonates, singly or in combinations, can successfully eliminate crystalline scale formation at high pH levels and supersaturated conditions. Inhibitors are chosen on the basis of the system's makeup water characteristics and the metallurgy of the heat exchange equipment. Anodic inhibitors such as polyphosphates, silicates, lignosulfonates and other organics are used in combinations, and these often achieve synergistic effects.

Special organic inhibitors provide extra protection for copper and copper bearing alloys. Where water is hard enough at these elevated pH conditions, a calcium-organic complex can offer the necessary cathodic inhibition. Acidic waters low in hardness content need a strong cathodic inhibitor such as zinc to supplement the program.

Because development of technology in nonchromate treatments has not been evenly distributed throughout the industry, questions have been raised about the effectiveness of this type of treatment; but results obtained with these less toxic programs are excellent, and average operating costs approach that of conventional chromate/phosphate/zinc programs.

d. Microbiological Control Programs

An ideal answer to present and future pollution control effluent standards is a nontoxic toxicant. Since this is a contradiction in terms, the next best approach is a toxicant that can be detoxified. Such chemicals as acrolein and halogenated organics are available and can be neutralized by sodium sulfite after performing their function. These and similar materials are expected to phase out conventional products such as chlorpenates, thiocyanates, quaternary ammonium compounds and carbamates. While purchase of these products is economical, their detoxification is not.

Chlorine and chlorine donors are still considered acceptable ecologically because chlorine is sufficiently volatile to be virtually expended across the cooling tower and is usually present in effluent, if at all, in small quantities. With systems now moving toward higher pH operating levels, the effectiveness of chlorine as a toxicant is automatically reduced markedly. Nonoxidizing biocides are becoming more economical than chlorine in many instances.

Water treatment firms have more to offer than chemicals and treatment. Their programs are, or should be, carefully engineered to meet specific requirements of each system. They provide corrosion control, deposit and biological control and must comply with pollution control standards.

Competent service accompanies treatment recommendations, together with regular followup calls by the company representative to assure good control is being maintained. A qualified supplier also makes available the experience and training of a large engineering staff, as well as the resources of extensive and well-equipped laboratory services. They should be able to provide monitoring programs giving satisfactory evidence that the system is properly protected.

This broad range of professional services is an excellent criterion for choosing a water treatment supplier, and will often mean the difference between successful water treatment programs, and ones that leave the air conditioning system shutting down for repair or parts replacement when it is most needed.

BIBLIOGRAPHY

1. "Construction Advance Predicted for 1971," *Heating, Piping & Air Conditioning*, 27, (1970) December.
2. "Control Manufacturers Predict Continued Growth for Automation," *Heating, Piping & Air Conditioning*, 33, (1971) June.
3. J.M. Teskoski, "Rooftop Units Clamp Lid on School Cooling Costs," *Heating, Piping & Air Conditioning*, 81-84, (1972) May.
4. *Handbook of Air Conditioning System Design*, Carrier Air Conditioning Co., McGraw Hill Book Co., New York, New York, 1965.
5. D.L. Brennan, "How Absorption Chillers Function," *Plant Engineering*, 56-57, (1972) July 27.
6. Carl C. Whitcomb, "Cooling Water Treatment Automation Saves Money, Resources; Cuts Downtime," *Heating, Piping & Air Conditioning*, 86-88, (1970) October.
7. John R. Schieber, "Control of Cooling Water Treatment: A Statistical Study," *Technical Paper*, BETZ Laboratories, Inc., Trevose, Pa., 1970.
8. *BETZ Handbook of Industrial Water Conditioning*, 6th edition, BETZ Laboratories, Inc., Trevose, Pa., 1962.
9. J.M. Donohue and C.V. Sarno, "Pollution Abatement Pressures Influence Cooling Water Conditioning," *Materials Protection and Performance*, 19-21, (1971) December.
10. J.M. Donohue, "Cooling Water Treatment - Where Do We Stand?", *Materials Protection and Performance*, (1972) June.
11. Edwin W. James, "Treating Cooling Water to Inhibit Corrosion," *Plant Engineering*, 104-106, (1972) November 16.

COST AND PERFORMANCE CONTROL FOR BUILDING MAINTENANCE

Maintenance and operation of the physical plant involve men, materials, tools, equipment, systems and procedures. To effectively coordinate these elements to control a physical plant, administrators need extensive experience in building maintenance and operation management under diverse conditions.

A physical plant administrator recently offered this observation of typical problems prior to obtaining "control": "Building maintenance and operation departments with high costs may have had an inefficient, uncoordinated and floundering organization for years. Too often, the physical plant is an organization with built-in delays that is less than 50% effective; that is, workmen are productive less than four hours out of eight.

"Uncontrolled maintenance is essentially a system of delays. The rule, rather than the exception, is for a maintenance man to wait for instructions, for machines, for material or for other crafts. Jobs are delayed while maintenance men look for material, travel to the job site and obtain tools. In addition, interruptions are frequent. Basically, maintenance men want to do good jobs in minimum time, but may not be as effective as desired due to working conditions."

Symptoms of Lack of "Control"

When craftsmen, earnestly trying to find out what should be done, are confused and delayed, poor communication is apparent. Program users, preoccupied with academic problems, are bothered and interrupted. Physical plant supervisors, working diligently to handle problems continually cropping up, are dismayed, discouraged or reconciled to their lot. The results are predictable: Poor performance, high costs, lack of confidence in the physical plant and friction between them and program users.

Coordinating men and material is a problem when craftsmen try to determine material requirements and availability *after* the job starts. Striving for maximum usage, program users are discouraged seeing idle space and equipment. Physical plant supervision knowingly permit craftsmen to hunt for materials to complete jobs–they have no alternative. Results: Job delays, interruptions and temporary repairs causing poor performance, high costs, lack of confidence and friction.

Properly skilled craftsmen may be unavailable when required. One craft waits idly for another craft to arrive. Both may arrive at the job site at the same time when only one craft can work at a time. Basically, they want to do their job, once, properly with appreciation shown by their supervisor. Program users confronted with cost control efforts see visible evidence of lost time.

Physical plant supervision realize their men are not as productive as they might be. Assigning too many men to jobs may prevent accomplishing more work with the same number of men. While it is wise to overman certain emergency jobs, routine maintenance, repair and construction are not two-man or multi-craft situations.

Ineffective Solutions

In plants where such problems exist, administrators may strive for solutions. Improved work order and material control procedures may be invoked adding paperwork and resulting in less supervision of craftsmen. Planning and scheduling may be started requiring the supervisor's absence from his men more than before. Job cost and variance

---

By JOHN V. LAMMERS. *The author is a graduate mechanical engineer (Washington University, St. Louis) with many years experience as a consulting engineer. In that capacity he worked 13 years for the Carter Carburetor Corporation of St. Louis and for the past 10 years with A.T. Tierney Company, a Chicago management consulting firm. Lammers now works in Los Angeles and has done management consultation for the University of California, Disneyland, Los Angeles City School District, University of Illinois and many other organizations.*

reports may be issued requiring still more analytical work by supervisors.

Management often realizes improvements have not helped as expected without having time to take corrective measures needed. Valuable information may be gained for specific situations, but performance of the physical plant department and costs of the total function still require much improvement.

To overcome these inefficiencies, the physical plant administrator personally may become involved in a variety of attempts. A new work order system and coordinating meetings may be partially successful in overcoming particular difficulties, only to ignor other problem areas. They may *not* alleviate frequent starting and stopping of jobs, lack of materials and insufficient job supervision.

In many physical plants it is evident that basic in-house background does not exist to implement ideas effectively Most departments cannot afford to assign men to devise a system by trial and error, requiring several years to "de-bug."

Broader experience, talents and skills may be needed to achieve tangible results. Probably, action is needed to preclude dilution of existing improvements.

Physical plant administrators who have successfully implemented planning and scheduling have had experiences parallel to these. They too gauged work backlog by how high job orders were stacked on foremen's desks. They had no method of estimating effectiveness of crews. Coordination between crafts, maintenance and program users had been poor.

Management consultant firms such as A.T. Kearney, Inc., are qualified to evaluate physical plant organizations and help management grasp opportunities for improved performance and reduced costs. They bring to assignments the *time* necessary to work uninterrupted toward solutions to problems. They provide *objectivity*–impartial and independent, uninhibited by political, traditional or historical considerations. They offer *experience* in analysis and solution of similar maintenance and operating problems for many organizations. They also have an *understanding* of the complexities and interrelationships of management problems, particularly involving the "human factor."

While they offer no panacea, they endeavor to apply pertinent specialized, as well as overall, management skills. With each recommendation tailored to particular needs and abilities of the physical plant organization, their objective is to arrive at sound solutions and to develop in-house personnel capable of carrying on after the consultant completes his assignment.

To insure that trained personnel are available to implement the course of action, representatives from the physical plant department should work with the consultant. Costs for consultant services are reduced, pride of in-house authorship is created and effective, tangible results are more easily achieved.

Requirements for "Control"

Most physical plant administrators know they need to schedule and coordinate maintenance. They know they need the right craft on the job at the right time. They realize they need to know how many men are required, what the total job time should be and what methods and materials should be used to prevent job delays and interruptions. They know they need *control.*

Experience has shown performance improvement and control require consideration of a minimum of ten objectives:

1. *Consistent Estimating.* For scheduling purposes, the estimated time required to perform a given job should be consistent and should be made known in advance;
2. *Methods Analysis.* The best job method should be made known before the job starts. Consideration should be given to using the best method regardless of tradition. This may require different tools, material and changes in work habit;
3. *Elimination of Delays.* Knowing in advance the estimated time required and the job method to be used permits more realistic scheduling which helps eliminate delays;
4. *Coordination of Crafts.* Where each craft supervisor knows job content, job sequence and estimated time per sequence, it is possible for him to improve coordination with other supervisors;
5. *Improved Supervisory Control.* Reduction in foremen's paperwork allows more time for directing efforts of hourly employees–their primary responsibility. Realistic time estimates and method analysis provided in advance also permit foremen to question poor performance immediately to determine future improvement measures;
6. *Training.* Need for training craftsmen in certain skills must be made known to improve performance. Need for additional training of supervisors in techniques of supervision may be required to maximize performance. Also, training future physical plant administrators should be considered;
7. *Materials Control.* Material, tools and equipment are needed in the proper place in sufficient quantity at the correct time to help keep craftsmen productive. Making known the job method in advance permits stocking needed materials;

8. *Work Backlog Control.* The work backlog of each craft should be known to permit more realistic scheduling. Establishing the proper number of craftsmen required allows analysis of the need for outside contract services;
9. *Controlled Manning.* Knowing the work backlog of each craft, time required and method to be used permits adjustment of crew sizes. Proper adjustment of crew sizes provides better craft coordination and more effective, realistic scheduling;
10. *Cost Control.* To satisfy academic program users in rapidly changing times, new and better methods are required to control and reduce costs. As equipment becomes more complex and costly and as space costs increase, maintenance requirements become more precise and demanding. However, to preclude increases in maintenance costs from dissipating potential cost reduction, caution must be exercised even in modern physical plants. To achieve tangible results objectives first should be economical and feasible on a continuing basis when performed by available personnel.

Initial Step in Gaining "Control"

Preliminary studies or surveys can determine improvement measures required. Changes needed, costs incurred, time required and cost reduction potential should be established. Without commitment to a course of action, and before change in present operating procedure is made, requirements for implementation of formal improvement measures should be studied, documented and substantiated.

The present organization should be studied to determine and define functional lines of responsibility and authority. Organizational control of labor, material, systems and procedures should be defined to determine present methods and compatibility with complete "control". Revisions required to the existing organization should be announced before implementing controls, allowing for reassignment of existing personnel when possible.

Existing facilities should be reviewed to determine effect of existing craft shops, equipment, stores and salvage operations on potential improvement. Physical layout of the plant and shops must be considered. Transportation and communication requirements should be analyzed. Problems resulting from inadequate facilities should be investigated before attempting to implement complete control.

Systems, procedures, methods and controls presently in use should be analyzed. Existing reports for financial control need not be disturbed for they usually provide valuable cost distribution information and are the responsibility of accounting and finance departments.

Extent of revision of existing maintenance paperwork required to achieve control should be known. Due to the tendency to resist change and the time required to acquaint personnel with change, as few changes as possible should be made. Even though innovations are usually required, this should be done with a minimum of paperwork.

The present performance level of maintenance should be identified. Identifying the present performance level is important in establishing the basis against which future improvement can be measured reliably. A representative selection of jobs for each craft should be studied to determine present performance by craft against predetermined maintenance standards. A.T. Kearney, Inc.'s *Simplified Maintenance Standards,* based on accepted industrial engineering techniques, offers consistency, objectivity and ease of application not permitted by individual estimating, historical averages, work sampling or detailed engineered standards.

It is equally important to project potential performance improvement realizable by adopting recommended improvements. This projection provides an accurate estimate of potential cost reduction and is needed to evaluate economic feasibility of implementing formal control.

Normally, potential cost reduction and performance improvement provide economic justification, and required changes are acceptable and desired by the administration. On this basis practical and reliable decisions can be made to implement improvements required to obtain tangible control of physical plant function.

Need for Planning

Improvement measures should be based on the conviction that planning is essential to achieve control. Planning is devising a course of action in advance and prearranging details for maintenance, repair and construction work performed by hourly personnel. Planning permits identification, communication and measurement of maintenance and requires identification of eight factors:

1. Scope of job
2. Location of job
3. Priority of job
4. Methods to be used
5. Materials required
6. Tools and equipment required
7. Craft skills required
8. Craft manpower required

The job's magnitude and complexity determine the applicability of detailed planning. Certainly, multi-craft jobs should be planned. Jobs affecting safety of personnel, continuity of operations and increased usable space and equipment should be planned, as well as repetitive jobs. Minor routine jobs such as tightening V-belts, replacing fuses and light bulbs and adjusting valve packing glands may not require such detail.

Need for Maintenance Standards

To assure continuity of meaningful planning for maintenance supervision and craftsmen, some form of discipline is needed. Experience in over 250 organizations indicates that the application of Simplified Maintenance Standards provides a consistent and realistic measurement of improvement progress for administrators. Application of standards permits automatic generation of material, tool and equipment requirements.

Improvement measures, therefore, should be based on advanced, detailed planning through application of maintenance standards. Prerequisites and understanding are required; for improved effectiveness all personnel involved need to be familiar with the concepts of the program.

Implementation of "Control"

Introductory meetings with supervisory, staff and craft personnel serve appropriately to introduce content and objectives of the maintenance control program, and to stress that it has been designed for their benefit.

It should be understood that maintenance planning separate from craft foremen is required to improve performance. Experience has shown that most maintenance foremen cannot adequately *plan* maintenance work and *supervise* efforts of their craftsmen. Job planning or job supervision and coordination, or both will be neglected.

It should be understood that planning to improve maintenance performance must be done before the job starts. Effective scheduling of personnel requires advance planning to obtain greater productivity from craftsmen. Consistency of craftmen's effort is the primary factor; work pace is not.

During introductory meetings, occurrence of emergency work should be discussed. Most emergency work cannot be completely preplanned and will interrupt otherwise effective scheduling. Precise definition of emergency work should be explained and discussed.

After introductory meetings, maintenance work planners should be selected from existing personnel. Planners should have responsibility to plan work in advance, apply Simplified Maintenance Standards, schedule and dispatch manpower, material, tools and equipment, determine work backlog and report craft performance. Personnel selected as planners must have craft experience and job knowledge. Since the planning activity is merely being formally centralized into a staff function, it should not be considered a new or added function. Consequently, selected planners need not be replaced.

Well-trained and proficient planners are a key to the success of control. They require training to be proficient planners and to apply Simplified Maintenance Standards and implement meaningful controls. Depending on the size of the department, approximately six to eight weeks are required to train planners.

Management control techniques are required. Revision and issuance of new procedures as determined in the preliminary study should be accomplished before the end of planner training. Procedures include work order, timekeeping, material stores, delivery and control, planning, estimating and scheduling and control reporting for management. These procedures should be carefully developed with all supervisory personnel who will use them.

As soon as planners are trained and revised procedures are instituted, maintenance can be planned in advance. Initially, coverage may be low. As planners gain confidence and become proficient and as maintenance supervision becomes familiar with the benefits available, planned work coverage will progressively increase. Improved maintenance performance will result.

Results

Experience with completed maintenance management control programs have been gratifying. Cost reductions in hourly labor have averaged 20 to 30% after deducting administrative costs of the planning staff.

Implementing control over a physical plant function is not easy. The road to improved performance is rocky. Harassment will continue from many sources even with controls. With controls, however, workload is lighter since Simplified Maintenance Standards provide the discipline to assure effective advance planning.

The results are worthy of consideration by administrators. Labor control, craft coordination, materials control and active supervision result in tangible cost control of the physical plant.

BEWARE OF HOUSEKEEPING CONSULTANTS

Who needs consultants? In order to answer that question, first determine what a consultant is. The Thorndike-Barnhart dictionary defines a consultant as "a person who gives professional or technical advice."

Why do people need help from others? Because they live in the age of the information explosion. More information will become available in the next ten years than in all the centuries before. Libraries built twice their present size will overflow with books in 10 years. A century of thought and invention is now being compressed into a thousand days.

This mass of facts and viewpoints has created change. Of all scientists, engineers, inventors, researchers–people who make change–who ever lived, 90 per cent are at work *now*, changing things!

This flood of information and change demands intense specialization. Once engineers were glorified mechanics who built bridges and designed tools; now there are ceramics engineers, textile, cryogenics, vibration and industrial engineers. There are even subspecialties: industrial engineers work in time study, methods analysis, hospital systems, rate setting and operations analysis; a few even work in housekeeping management!

The question is not *if* to use consultants, but *when* and *whom* to use.

The differences between consultants who charge for their time and ones who do not is the difference between professions and hobbies. The registered engineer who consults puts his license to practice with every recommendation, and with every contact, just like a lawyer or C.P.A.

It is time to consider paying for consultation when the organization:

1. Is strong enough to implement recommendations and to sustain improvements;
2. Is growing fast and needs the equivalent of an experienced staff it cannot afford to develop and keep full time;
3. Has made all internal improvements it can and feels need for objective analysis;
4. Cannot get from management and other departments the interest and support needed to function effectively;
5. Wants to improve morale by demonstrating management is willing to invest in a motivation and training program.

When an organization needs professional help it looks for the best help at a reasonable cost.

There are many types of consultants, generalists and specialists. Some firms specialize in "head chopping"; some are general management consulting or accounting firms who will work in the custodial field as a sideline. Some are combined-service organizations which not only consult, but also provide contract cleaning services and sell you chemicals! Such an organization raises the question: What are they trying to sell? Service Engineering Associates, Inc. is an independent specialist.

The consultant chosen must have a business and professional philosophy consonant with the organization it serves. The client-consultant relationship should evolve: After interest is shown by a potential client, a proposal should be developed to assist the client in meeting his objectives. In order to make a proposal and provide later service that is objective, contract cleaning services should not be provided by the consultant, nor equipment or chemicals sold, nor sales or services by others promoted. Thus, the consultant may serve objectively:

1. Clients who do their own cleaning.
2. Clients cleaned on contract.

By **EDWIN B. FELDMAN, P.E.** *President of Service Engineering Associates, Inc. (Atlanta, Georgia), the author has been a consultant to the University of Hawaii for the last five years on custodial operations studies; program development in staffing, personnel assignment and training; and assistance in the implementation of these programs. He is the author of three books:* **Industrial Housekeeping**, **Housekeeping Handbook** *and* **How to Use Your Time to Get Things Done**, *plus numerous articles in various professional trade and technical journals. He is also working on a fourth book,* **Building Design for Maintainability**, *to be published soon.*

3. Contract cleaners.
4. Government.
5. Organizations and institutions.

Discussion of objectives in the early work state is important. Service Engineering Associates, Inc. typically employs one of three general objectives:

1. Cost improvement within fixed quality levels;
2. Quality and morale improvement without exceeding a fixed budget (sometimes including consultant fee);
3. Open objective fostering suposition of whatever opportunities exist for quality and cost improvement, without limitation.

At this point, some organizations consider the "audit" approach, which provides a more cursory or general analysis than would a complete study or programming. Typically, audits provide specific analysis of example buildings or facilities, extrapolating data to indicate likely results for the entire physical plant; opportunities are shown for improvement in equipage, chemicals, structure of department, supervision, scheduling and procedures. Not only does the audit predict what might be accomplished through more complete study, it also provides an opportunity at smaller risk for the client to familiarize himself with consultant personnel and operating procedures, thus establishing an atmosphere of confidence involving management and the work force. Normally, half the fee for an audit can be credited against a more detailed study (based on the amount of information related to both services).

The fee must be calculated as a direct function of engineering time involved, plus expenses, rather than "what the traffic will bear". Options might be offered concerning implementation services, and later "on call" services. Be very suspicious of any custodial consulting fee exceeding 2 or 3% of the custodial budget during the service period except for a small operation.

In selecting a housekeeping consultant, pursue these questions:

1. Does housekeeping consulting represent the fundamental service provided by the consultant, rather than a sideline?
2. Is the work performed by professional engineers?
3. Is the consultant entirely independent of supplier and contract cleaning organizations without interest in such firms?
4. Is the consulting firm owned entirely by its own consultants without outside interest?
5. Are fees based only on time involved (and expenses) by professional consultants?
6. Are services and fees specific, eliminating the need for additional services and fees.
7. Have the consultants worked at least ten years in this specialized field?
8. Do all consulting firm personnel work full time in professional consulting activities?
9. Does the consulting firm broaden its fund of experience through seminars and other educational activities?
10. Does the consultant provide a comprehensive reference list?
11. Has the consultant contributed to the literature of housekeeping management?

The consultant's services should comprehend these factors:

1. Program should be operable with existing supervision and labor whe.ever possible
2. Consultant should work himself out of the job within a reasonable time, usually after one year of implementation.
3. All assignments should consist of a reasonable day's work.
4. The services should benefit wherever possible all three levels of personnel involved: management, supervision and custodial help.
5. Use should be made of the "work design" concept of creative analysis, rather than specific criticism.

Who needs consultants? Those

-Who are not able to cope with the information explosion unassisted

-Whose lines of communication to management are not without obstruction

-Whose management is not confident in the objectivity of in-house recommendations

-Whose management does not understand the balance between housekeeping quality and cost and who has not provided sensible objectives

-Who have neither a static organization nor time to make changes

-Who cannot train and motivate supervisors and workers adequately and regularly

-Who are not able to stimulate management to act on in-house recommendations

-Who have not been able to develop the proper status and compensation for the department and its members

-Who have no broad experience in *all* phases of the work in many different organizations and locations.

A manager is a person who gets things done through others. He turns to consultants for help, not because he is inadequate, but simply because he has enough understanding and self-confidence to a *good* manager.

QUESTIONS AND ANSWERS

Question (Bob Farley, Occidental College): We have recently been approached by contract housekeeping and custodial maintenance firms which say they can provide service with about one-third the personnel an independent consultant would use. How should we approach this kind of presentation? We do not have the resources to evaluate their proposals ourselves.

Answer: When our firm does work for an organization that wants contract cleaning, and some university and college clients do, we think there is only one legitimate basis for comparison. The cost of contracting should be based on services and personnel the department would use were it performing the work itself. The only way to compare costs is to measure requirements, apply time allowances, analyze structure and organization, determine how many people will be needed and what equipment will be used and judge job frequency of both in-house and contract maintenance

Question (Dale Hawn, Grinnell College): You alluded to employment of students and then amended your statement to employment "under certain conditions." Would you outline those conditions?

Answer: Never attempt to use student help for less than two-hour blocks; using a student for 1½ hours at a time is "spinning wheels." The preferable time allowance should be three to four hours at a time, because what is lost is the make-ready and put-away time–a bigger percentage of the total in smaller time increments. Also, it is not desirable to use students every night because of their studies and other activities; it is much better to have two shifts–half working Monday, Wednesday and Friday and the other half working Tuesday, Thursday and Saturday or the weekends.

Secondly, student help will need intensive supervision because their working hours are short and there is a high turnover rate. They must also have good training, which some say is useless because of the turnover. The higher turnover makes the training more necessary. The basic considerations, therefore, should be for longer work periods, adequate supervision and training on the job. Also, if the department can grade their performance on their permanent academic record, students will work 50% harder. Some people have been able to do this, and I urge you to do it if you can.

Question (Sumner Holbrooke, Phillips Exeter Academy): Would you comment on the hourly rate for student workers compared to the hourly rate for permanent adult employees?

Answer: It should be the same.

Question: In every case?

Answer: If they are to be responsible for doing the same work they should be paid at the same rate.

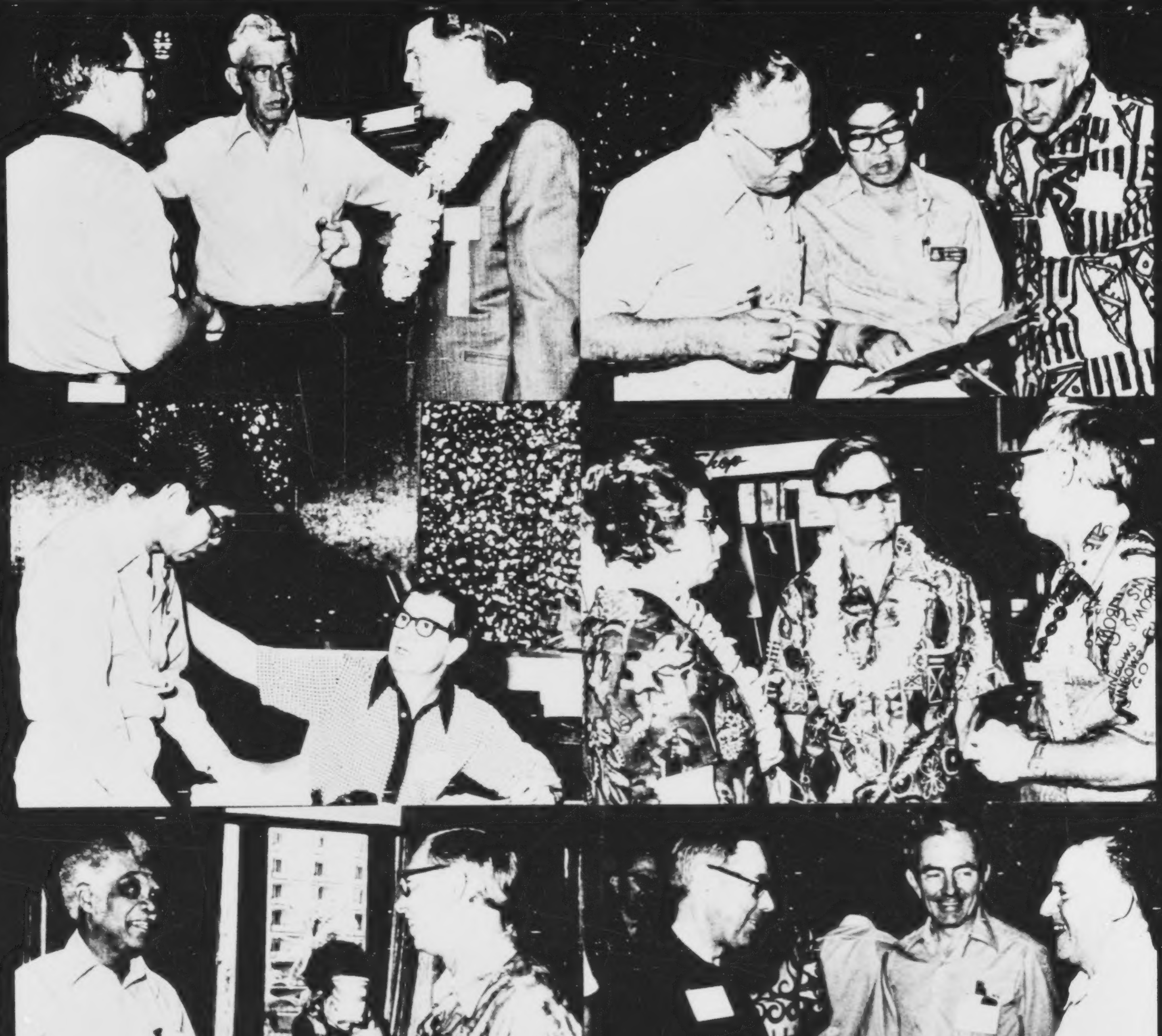
Question: Have you had experience with using classifications such as Custodian I, II or III?

Answer: That kind of classification goes against the pay law of 1963. Some people have been successful with using the system thus far, but they may be overruled at the time of their next Department of Labor inspection.

Question: What if one custodian uses mechanized equipment and another does not?

Answer: In the case of the Department of Labor versus Waynesboro College the defending lawyer said pay grade I employees did all lighter-duty work (i.e., dusting), while pay grade II employees did machine work; the court said the extra skills required to operate the floor machine are counterbalanced by the manual dexterity required for dusting, therefore the jobs are equal. That is the rule now. If a lighter duty task occupies less than 50% of the work time, the court says the tasks are equal to more skilled labor, and therefore the pay should equal. Men and women in housekeeping departments should have the same starting rates or the situation may end in a lawsuit.

COFFEE/PINEAPPLE JUICE BREAKS—Morning and afternoon recesses in the busy educational agenda and daily sandwich lunches provided opportunities for registrants to exchange ideas with one another and to discuss various products and services with exhibitors.



AMERICAN GILSO
GILSO-THE
CENTRAL SYSTEM
LIMITED USER BENEFITS
BUILDING AUTOMATION SYSTEM
APPLICATIONS
PERMA-PIPE
SARGENT
MAXIMUM SECURITY SYSTEM
LOCK COMPANY
SCHLAGE
SOLAR

Carrier
Carrier
NUMBER 1 AIR CONDITION
50th
KOOLSHA
SOLAR SCRE
security
SARGENT
SARGENT SECURITY SYSTEM
archite

EXHIBITORS

APPA wishes to gratefully acknowledge the valuable contribution of the following firms to the success of the convention. Without their enthusiastic support, gracious hospitality, and attractive displays, the convention would have been substantially diminished.

AMERICAN BILTRITE RUBBER COMPANY, INC.
AMERICAN GILSONITE COMPANY
BEST LOCK CORPORATION
CARRIER AIR CONDITIONING COMPANY
CERAMIC COOLING TOWER COMPANY
DAY BRITE LIGHTING
GYMNASTIC SUPPLY COMPANY
HAGER HINGE COMPANY
HILLYARD CHEMICAL
HONEYWELL, INC.
HUSSEY MANUFACTURING COMPANY, INC.
INTER ROYAL CORPORATION
JOHNSON SERVICE COMPANY
JOHNSON WAX
KOOL SHADE CORPORATION
LCN CLOSERS
PERMA-PIPE, DIVISION OF MIDWESCO ENTERPRISE, INC.
RIC-WIL, INC.
ROYCE ROLLS RINGER COMPANY
RUSSWIN DIVISION OF EMHART CORPORATION
SARGENT AND COMPANY
SCHLAGE LOCK COMPANY
SERVICE ENGINEERING ASSOCIATES, INC.
J. A. SEXAUER MANUFACTURING COMPANY, INC.
STANDARD DRY WALL PRODUCTS, INC.
STRANCO
THERMAL CONDUITS, INC.
UNICON PARKING STRUCTURES
VAPONICS, INC.
VOLUME INDOOR PARKING, INC.
VON DUPRIN
XEROX CORPORATION

BUILDING DESIGN FOR EASY MAINTENANCE

Recently, the inflationary spiral has affected everything associated with care of buildings and grounds, including labor, machinery and supplies, and many people are looking for ways to reduce building maintenance. The problem of inflation is insoluable at this meeting, and there is also no way to *guarantee* reduced maintenance costs.

Reducing maintenance can generally be accomplished through proper planning, efficient design, proper materials and efficient maintenance procedures. These procedures are outlined below in greater detail.

Proper Planning

In applying effort toward reduction of maintenance in schools, planning is perhaps the most important commitment to be made.

An important part of this commitment is realizing that care of buildings cannot be planned as done previously, because buildings are different. There is an entirely new set of circumstances and good planning can best be achieved through adaptation, rather than old repetitive processes.

For example, architects and contractors traditionally decide what materials are needed in a building. When the structure is completed, the keys are handed to the maintenance staff and they clean it for the next 40 years. Wouldn't it be better if the maintenance staff was actively involved in planning the building? If it is not possible to involve them in the entire process, certainly it would be helpful to solicit their aid regarding such things as materials selection.

Taking this approach accomplishes several things. Useful options are obtained reflecting local needs and desires.

More importantly, maintenance staff feel like they have played a part in the decision-making process for the new structure. If a person identifies with something he will work harder to see it functions properly, and this is an important first step in attaining efficient, productive care of a new building.

Another planning resource is inservice training. In the past this was mainly provided for teaching and administrative staffs. However, today there is great need for inservice training for maintenance staffs as well. Newer and more complicated machines are available, buildings are constructed with different materials and time is a greater problem.

Few organizations provide inservice training to maintenance staffs. Some universities offer this service, the School Planning Laboratory at the University of Tennessee being a good example. Also, there are some private sources such as the Custodial Training Foundation in Illinois, and commercial sources including Monsanto and Dupont.

Proper Design

Proper design applies not only to campus buildings, but also the grounds around them. Both these areas deserve consideration from a maintenance standpoint as the total master plan develops.

First apply the problem of reducing maintenance to campus grounds, remembering that there is a great deal of difference between today's campus and yesterday's cinder school yard. Today buildings are surrounded by a complex of parking lots, loading areas, athletic fields, roads, walks and even outdoor classrooms, used day and night by students and the community.

By JAMES L. CROCKARELL, Ed.D. *The author currently serves as an educational consultant to Ellerbe Architects (St. Paul, Minnesota), one of the largest architectural firms in the country. Dr. Crockarell has recently been involved in educational planning nationwide; significant projects include development of the planning program for the Mayo Clinic, master planning for the University of Albuquerque, a rural development plan for high schools in Alaska and master planning for the Washington Technical Institute (Washington, D.C.). He formerly worked in school planning at the University of Tennessee and has held various teaching and school administration positions in public education.*

The site has taken on an importance that rivals the building structure itself. This is true because the modern university has taken on new roles and responsibilities, and its activities stretch to every corner of the campus. As the character of the site has changed so has site planning and design. It no longer means putting a building on a piece of land or adding a building to a campus at a ramdomly selected location. Site planning takes into consideration every function of the grounds and integrates these into one overall smooth-working facility that will be economical to maintain.

Design and planning for easy maintenance extend also to site selection. Some things to consider are:

1. Site is easily accessible to avoid maintaining elaborate road and walk systems;
2. Flat or easily sloping site will be more problem-free;
3. Avoid highly exposed sites. A protected site will usually require less care in terms of plants, snow removal, etc.;
4. Select site with soil promoting growth of grass without excessive watering and care.

After the site is selected it is important to integrate all elements involved. Elements that must be considered are building location, roads, walks and play areas, parking lot, loading area, service areas, lawns, seedlings, and the site's natural features.

Some helpful ideas to keep in mind are:

1. *School building* should be located on site at a position that will provide low-problem maintenance. For example, slopes should provide good drainage away from the structure.
2. *Parking areas* should be over-built so that lawns never need to be used.
3. *Entrance roads* should be wide enough for maintenance vechicles and also should provide adequate temporary storage for refuse containers to reduce maintenance problem of cleanup.
4. *Pedestrian walks* should be wide enough to discourage walking on adjacent grass. Walkways should be built wherever pathways are made by students. Iowa State University has planned walkways wide and strong enough for vehicle traffic.

Looking at the building itself several design features reduce maintenace time and expense. The building constructed after involving maintenance staff in the planning process will probably be better suited for efficient cleaning operation.

In addition, research at Ellerbe Architects has indicated several design features help provide easy maintenance.

1. *Compact buildings* reduce the amount of walking necessary to get to different parts of the building, insuring less time spent on marginal activities.
2. *Windowless buildings* or structures with few windows offer several advantages–less breakage and vandalism, decreased cleaning area and less heat loss or gain.
3. *Systems and component construction* using uniform materials throughout the building enables the maintenance department to maintain lower supply stocks and simpler operation.
4. *Common service shafts* containing various mechanical systems allow for centralized repair and easy operation.
5. *Good space relationships* not only serve the school program but are arranged to accommodate necessary custodial storage for each area of the building.

Special attention should be given to custodial rooms. These facilities should be carefully planned and designed for each campus building. Some useful hints are:

1. Provide an adequate centralized area for the exclusive storage of cleaning materials and equipment.
2. In custodial closets, install floor drains with 8" curbing instead of utility sinks, when possible.
3. Provide adequate sources of both hot and cold water for custodial use.
4. Electrical outlets should be located not more than 75 feet apart in corridors and large rooms.
5. Provide private locker and shower space for custodians.

Minimum Maintenance Materials

The discussion thus far has been concerned with planning and designing buildings for easy maintenance. Surface and building materials required for buildings and campus must also be examined.

Proper care of the campus is just as important as internal building care. Several options available make this job easier.

Recommended paving materials for easy maintenance are bituminous asphalt and concrete. Concrete lasts longer but the initial cost is higher. For minimum upkeep both should be applied over a well-constructed base and be coated with sealers. Never install asphalt on a grade over ten percent, as it is impossible to get proper compaction.

Curbing projects using granite will be the most indestructible. Concrete and asphalt are also used but they are subject to greater weathering and snowplow damage.

Of *sidewalk materials*, concrete is most acceptable with blacktop the next choice.

Exterior steps should be eliminated where possible. Stone is the best choice of materials since it has a better nonskid surface and can withstand damage from elements.

Handrails should be required along all exterior steps and they sometimes require extensive care and painting. The best material to use is anodized aluminum. It requires no painting and it also resists corrosion.

Exterior lighting materials should not require much maintenance time. Aluminum fixtures serve this purpose quite well.

Athletic fields formerly were monopolized by grass. New artificial materials are now used when monetary considerations are not overriding. As for overall maintenance, artificial surfaces appear to be far superior.

Running tracks should use some type composition material or one of the new synthetics for easy maintenance. Cinders are not acceptable.

Choosing the right material is extremely important in constructing a new building. Care must be given to assure that local climate conditions, usage, and expectations are taken into consideration.

Building floors have been the center of controversy for the last few years. The battle for carpet acceptance has probably been won—in fact there might now be "overkill". Carpeting has several educational and safety advantages that make it a very desirable floor covering. However, terrazo lasts much longer, especially in high use areas, and vinyl tile is cheaper. Carpet square blocks are being used more now to help alleviate maintenance problems that have heretofore hindered custodians with their use of this material.

Ceilings of acoustical tile have been popular for years and probably are the best material maintenance-wise, while providing educational environment benefits. Acoustical tile is easy to replace and requires little upkeep. Blown plaster has been a disappointment, and materials such as concrete are not educationally acceptable even though good from a maintenance standpoint. From a maintenance standpoint, the new idea of exposed steel girders and structure is difficult to justify.

Wall coverings have improved significantly in the last ten years. Vinyl coverings are easily maintained, especially when properly installed. Concrete block with epoxy paint is relatively cheap and cleans easily. Tile block has been very successful in hallways, dressing rooms, and areas where excessive soiling occurs. The key to good wall coverings in schools is using attractive surfaces not requiring paint or constant replacement.

Stairways are not suitable for soft-floor coverings like carpet if the concern is for easy maintenance. Normal life expectancy of carpet in this area is much less than the advertised 10-14 years for overall school carpeting. Use hard, compound stairways with smooth, continuous surfaces that can be easily swept and mopped.

School roofing of pitch and gravel is probably as good as any unless expensive tile is used. Plastic compositions need more development before they will be maintenance-free.

School lighting fixtures should be flat and recessed for easy maintenance. Exposed lights are dust collectors. Indirect lighting fixtures are especially troublesome to clean.

Furniture and desks should be smooth-surfaced for easy cleaning. A rough composition surface collects dirt in tiny grooves and appears dingy. This surface can be cleaned, but it is not labor saving.

Exterior walls are usually not great maintenance problems unless they must be painted, thus stay away from materials requiring paint. Brick is always good, although many people are now building with precast materials. If these are used, make sure they are soil or strain resistant.

Proper Maintenance Procedures

Time and money-saving architectural planning and design ideas affecting proper maintenance include: (1) Planning buildings and grounds with powered equipment in mind; and (2) Wringing utmost efficiency out of these machines.

A time study by Jacobson is a good illustration of these points. Through tests run in the midwest it was shown that in many cases large power equipment could complete lawn care jobs in almost half the time of smaller units, yet its initial cost was only one-half of three smaller units used in the study. Add to this that smaller units require more maintenance and the economy of selecting the larger machine is easily seen.

Smaller equipment has a place in maintenance programs. For example, most universities need small vacuum cleaners as well as larger units for use in close places. For large multibuilding campuses, however, the greatest economy is achieved when the campus and buildings are: (1) Designed for maintenance with large equipment; and (2) Implemented through use of larger machines whenever possible.

A word of caution. Universities should not become "overpowered" sending the biggest piece of equipment available to do a small job. A well-balanced maintenance department will have equipment to efficiently handle various maintenance requirements imposed.

Many colleges report that increased mechanization of maintenance has permitted them to take on care of bigger and more complex jobs without adding personnel.

Conclusions

As originally pointed out, there is no guarantee that the design of a building will insure maintenance ease or a cost decrease. However, Ellerbe research indicates that if other aspects of the maintenance and operation program at a university are conducted properly, a 20% cut in cleaning staff is possible when a building is *designed* to prevent accumulation of dirt and save maintenace time.

Large numbers of custodians or supply salesmen will not be looking for jobs if better school planning and design procedures are implemented, but this is a logical first step in seeing that campuses are well-maintained with a minimum of effort.

QUESTIONS AND ANSWERS

Question (Robert Butler, University of California, San Diego): Could you describe in greater detail your central core concept and how it is different from what is being used now?

Answer: I am not sure what you are using now, but the central core concept differs in the way the laboratory systems are laid out. For instance, a structure will be 10 stories high with three shafts extending from ground level to the top of the building. All pipes, gas lines, water and laboratory supplies running into each laboratory are contained in the central shaft. There are three points along the wall of the laboratory facing the shaft where mechanical systems enter the laboratory. There are rigid benches leading to parts where wet-type activities occur. Dry activities are located against the corridor wall. This particular design configuation eliminates the rigidity of most laboratory space. In other words, activities requiring services, which formerly made the facility rigid, are placed in one area, and more flexible activities located against corridor walls, making it possible to change the laboratory around to any configuration people may want over the next 20 years.

Question (John Heinz, University of Washington): I noted in your photographs that the locker room was carpeted. Have you had good experience with carpeting?

Answer: Yes, with indoor/outdoor carpeting. It has worked well at the University of Notre Dame and at other universities, too.

Question (Heinz): Over what period of time?

Answer: The University of Notre Dame facility is about five years old and the carpet has done very well. The estimated normal life of indoor/outdoor carpeting is up to 10 years.

Question (Heinz): Is the locker room a dry area?

Answer: There is tile outside the shower and dry-off areas, but the carpeting in the dressing area probably gets wet occasionally. In situations where it is possible, it is good to consider using carpet blocks, which are constantly being improved. Then if an area is damaged, the block can be removed and replaced without disturbing the entire carpeted area.

THE FACULTY OFFICE-A SYSTEM OF FURNITURE AND STRUCTURE

In 1969, while developing plans for the University of Pittsburgh the idea occurred that of the advances in school buildings, design and construction and in technical facilities for education, research and communication, there has been no real improvement in the faculty office. A very important facility of the university has been neglected.

Too often the faculty office is considered space with a desk, file cabinets, bookcases, clothes tree and chairs. This is expected to meet the needs of a wide variety of specialists–engineers, geographers, geologists, biologists, anthropologists, musicians and many more. The faculty office is a workroom, research lab, private library, counseling room, viewing center, committee room, and most of all, a storage area. Over the years professors accumulate vast amounts of material essential to their specialties. These collections grow continually. To provide storage space elsewhere is not the answer. Increased demands on space and the high cost of "doubling up" is commonplace. Privacy and security have been unsatisfactory. These problems can be met if budgets are adequate, but to answer all needs, most schools' furniture budgets should be increased.

In addition to individual office flexibility, total office flexibility within the university is important. For some time university buildings have been constructed with permanence in mind. A well-built, well-designed modern structure should last for centuries. However, there is nothing permanent about function. The function of a building may change before the construction is finished. Building changes are routine. Doors and partitions are moved or added; rooms are divided into two. Departments outgrow their space and the whole department moves. The space abandoned is adjusted to a new use. Sometimes entire buildings change function. This constant adjustment is necessary if the institution is to succeed in its commitments and responsibilities.

All these changes involve partitions. Available demountable partitions, admirable for new office buildings, do not meet university needs. Example: A campus may have 50 buildings with no two having the same ceiling height or elevator size, and all except more recent ones having had total changes in occupancy. Moving ceiling-height wall panels from a central storage area to the point needed is expensive and inconvenient. Altering or changing stud partitions or masonry causes unacceptable dust, noise and debris. Invariably, installation of demountable partitions calls for filler sections to close the gap between the top of the partitions and the ceiling. These conditions increase the cost of demountable partitions by as much as three times over cost of installing the same partition in a building under construction.

The University of Pennsylvania, Temple University and the University of Pittsburgh jointly prepared a list of objectives considered necessary to meet demands of both faculty and institutional objectives. The industrial design firm of Raymond Loewy/William Snaith, Inc. was engaged to study the feasibility of creating an office system designed especially to meet these needs. The Educational Facilities Laboratories made a generous grant for this purpose.* Matching funds were supplied equally by the three universities.

Loewy/Snaith's design team reported the project completely feasible and, in addition, provided a concept which has been developed further. The furniture is now at the working model stage of design. The partitions still require much detail work. In working with the designers, some objectives were modified and many new ones added. It is doubtful that satisfactory performance specifications for this project would have been written without the many discussions with

*The EFL is a non-profit corporation established by the Ford Foundation to help schools and colleges with physical problems.

By HUNT V. MARTIN, JR. *The author is director of physical plant at the University of Pittsburgh and has been a member of APPA since 1970. He has a bachelor's degree in civil engineering from Rensselaer Polytechnic Institute, an MBA in business management from The American University and is the author of papers on central plant design and preventive maintenance management. He is a member of the American Society of Civil Engineers, the National Society of Professional Engineers and Chi Epsilon Honorary Fraternity.*

designers over a period of eighteen months. Principal objectives are:

1. Determine needs of the faculty;
2. Design furniture to meet these needs competitive with the lowest priced furniture on the market;
3. All parts or components to stack or nest, and be easily stored and transported;
4. All furniture to be assembled by unskilled labor at the site;
5. Furniture to be primarily wall hung;
6. Furniture to be usable with an existing wall of any type;
7. Furniture and partitions to have factory finishes;
8. Furniture to be part of a system which includes partitions;
9. All furniture components to fit on a 30" x 60" dolly--and one dolly to carry all the furniture needed for a single faculty office;
10. Partitions to have wall panels which fit on a 30" x 60" dolly;
11. Partitions to be completely demountable and reusable;
12. Partitions to be adjustable to varying ceiling heights;
13. Installation of support must not require skilled workmen;
14. Partition must conceal extension cords;
15. Entire system must be attractive.

The first step in determining needs of a faculty office is to visit numerous offices. Some are barren with only notice of office hours on the door. Others reflect professional or personal interests. Site visits for the study covered the three campuses and provided insight into the magnitude of the problem. Also, a series of seminars with faculty members of nine different schools was held. This was followed by a 26-item questionnaire sent to faculties of Penn, Temple and Pitt. The rate of response averaged close to 50%.

By transposing responses to punch cards, it was possible to analyze the results by university, school, department, rank and overall averages. Over 60% of the faculty of the University of Pittsburgh School of Law preferred a work surface at standing height with a sloped surface. No one in the School of Law at Temple University wanted to work standing up. These differences reflect the unique work habits of trial lawyers and corporation lawyers. Almost 30% of Pitt's faculty asked for a sloping work surface. Acoustical privacy was stressed frequently. Much research, report work and rating is presently done at home because of poor security, the questionnaire revealed.

The questionnaire proved there is no typical office, and that given the opportunity, every office would be unique. The possibility of uniqueness gave purpose to the project. By averaging the reported needs satisfying 50% of the faculties as stated in the questionnaire, the following items would be necessary:

1. Forty-five feet of shelving;
2. Two work surfaces;
3. One pedestal;
4. 30" x 30" storage cabinet;
5. Three file drawers;
6. Pigeon-hole unit;
7. Two six-inch deep drawers;
8. Pencil drawer.

All these items of furniture can be transported on a 30" x 60"dolly. A second dolly holds the panels necessary to build the two side partitions of a 120-square-foot office. The equivalent of these items in floorstanding units would allow little or no space for chairs, and the entire lower part of the walls would be covered.

The design has three aspects which interact to form a system: Partitions, furniture and supports. Partitions consist of two types. One is based on 30" x 30" panels called molded panel wall systems. The other is a refinement of a metal stud drywall partition. Of the two, the molded panel is more innovative. Components of the stud partition are also used to support furniture on an existing wall. The method of supporting furniture on partitions and on an existing wall is identical. Neither tools or skilled workmen are needed to place the furniture. Furniture is designed to support 300 pounds in addition to its use load. Tests with a mock-up prove this provision realistic.

The molded panel partition uses preformed panels, which interlock horizontally and vertically and which contain integrally molded furniture brackets and service runs. The system requires no studs; is simple to install, remove and alter; can be used in old or new structures for full or partial partitions; and has virtually unlimited flexibility. A plywood mock-up, 12½ feet long x 10 feet high, of the modular wall system was made at the University of Pittsburgh. It demonstrated the great structural stability and strength of the system. This partition could be erected in half the time of partitions already in use at the University.

Full module panels are 30 inches square; half panels are 15" x 30" and quarter panels, 15" x 15". All are factory finished on one side and grooved for interlocking on the other. Panel sizes allow easy stacking on dollies for transport through existing doors, elevators and hallways. Metal channels are attached to the floor and ceiling where the wall is divided. In a new building fastening devices can be preset in the floor.

To begin wall assembly, a full module panel is set in the metal channel. A half panel is then offset 15" horizontally and interlocked back-to-back with the full panel by mating projections and grooves. The wall is the thickness of two panels, interlocked back-to-back and secured with a fastening device. The strength of the wall results from the offset placement of these panels. This offset arrangement makes it possible to remove individual panels at will without lessening the strength of the wall. An opening can easily be made by removing full panels on one side and replacing full panels with half panels on the other side. A finished wall presents a different panel arrangement on each side. In any given room, both walls could be similar. Assembly or disassembly causes no appreciable dust, noise or interference with surrounding areas or activities. The channel formed by two panels butting together contains concealed bracket supports and space suitable for telephone and electrical cord runs. In this space telephone and electrical extension cords can reach any point on the wall. They will not interfere with the operation of the bracket support system.

Furniture System

The pigeonhole or desk organizer is the smallest furniture unit. The desk organizer consists basically of identical top and bottom units joined by two flat vertical joiner plates. The 30" x 30" storage cabinet uses the same top and bottom pieces but has larger vertical separators. This unit can contain adjustable shelves, shallow display trays or be left empty for storing larger items. When security is desired, the unit can be locked and fastened to the wall panel. Other storage units are 30" x 60" and 30" x 15". Bookshelves in 30" units hang on the walls.

The pedestal file unit for use with a separate work surface is the only floorstanding unit. It will accommodate either four six-inch drawers, two six-inch drawers and one file drawer or two file drawers. The identical top and bottom pieces of the pedestal file unit have also been designed so they can be stored efficiently. The side-opening file cabinet is formed from the same top and bottom pieces, but utilizes smaller vertical separators. File drawers stack to avoid air storage. They are of one-piece construction with integrally molded perimeter channels for folder hooks and drawer slide mounting.

Work surfaces of 30" x 60" are used either on pedestals or supported on a wall. They also can be mounted to provide storage for maps and drawings. A 30" x 30" work surface for equipment can also be used as a coffee table. Bracket supports for work surfaces 30" x 60" and 30" x 30" are identical. They can be placed at any height and can also support the work surface either flat or tilted.

Furniture Support System

The support system has been conceived so that various components can be combined and interchanged in a variety of ways to satisfy all but the most esoteric faculty needs. Indeed, the flexibility of the system is limited only by the user's imagination. For example, the typewriter surface might be placed near the floor to serve as a coffee table; cushioned, it could be a settee. Most units can be wall-hung ensuring greater ease of maintenance and more efficient use of space. Seldom-used material can be located near the ceiling.

Furniture units have also been conceived so that the same parts can be used in many units, be assembled easily and require less storage space. Stacking or nesting parts reduces air storage to a minimum. Furniture units can be attached to the wall without skilled labor or great effort. The bracket tab of the furniture unit is locked into the bracket support teeth of the wall panel. This method of attaching furniture is also employed in the modular stud wall system. A support bracket or hanger is attached to the wall. From it will hang the larger pieces such as the 30" x 30" or 30" x 60" storage cabinets. This makes it possible to place them at the top of the partition and to move them without tilting. Blackboards or chalkboards can also hang from it. Several panels can touch each other to form a continuous blackboard of any size.

Attaching furniture units to the wall is quick and simple. Each unit is tilted slightly for insertion and the bracket support is inserted wherever horizontal and vertical joints meet. Still tilted, the unit is raised or lowered to the position desired. It can then be leveled in increments of one inch and will support over 300 pounds. Returned to horizontal position, the unit is then ready for use. The ease of installation makes adding, removing or rearranging furniture a simple matter.

Metal Stud Drywall Partition

Steel stud partitions support all furniture units in the same manner as the module panel wall. They are similar in appearance, except that the horizontal joints every 30 inches are not present. This partition system is an alternate to the molded panel. When the modular stud system is used to erect an independent, freestanding partition, metal angles are placed on the floor. Leveling is done with a shim. Two uprights are fastened, back-to-back and inserted in the floor and ceiling angles.

A completed panel of 8-foot ceiling height uses two panels of 30" x 30". This panel size limitation has been set to facilitate stacking and transport through existing doors and corridors. Added heights, when needed, can be obtained by a third panel precut to size, or if the ceiling is less than ten feet, by using two 30" x 60" panels precut as necessary.

To Hang Furniture On Existing Walls

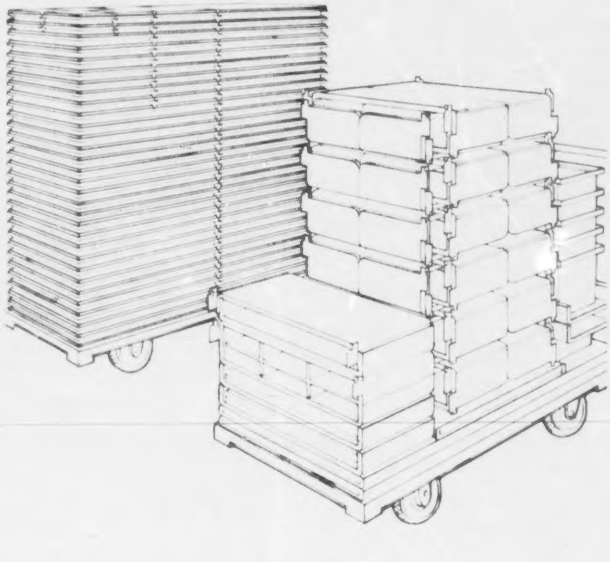
This support system can be used with any type wall including wood stud and wood lath and plaster. It employs materials and technology in current use, all components being identical to those used in the "New Partition of Steel Studs" previously described. The system is light and durable. It is simple to install and to alter after installation. The module is 30" high to make it compatible with all furniture units.

Basic to the system are floor and ceiling angle components which serve to stabilize and separate 30" vertical studs. Each of these two horizontal members consists of identical L-shaped angles which are joined together in a configuation different from that used in the stud partition.

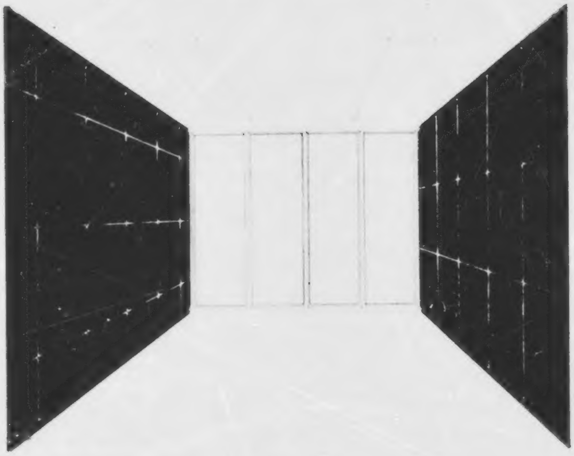
To attach system to existing wall the angles would first be shimmed level and then secured in place at points determined by the structural arrangement of the existing wall, or they can be attached to the floor. These studs contain concealed wall panel, furniture bracket supports and two vertical service wire runs. By keeping the vertical stud independent of the wall, the loads of the furniture units applied to the stud are transmitted to the angles at the floor. At this point the furniture can be added to the studs. The metal studs and angles would be painted to blend with the walls. If renovation is desired and wall panels are to be used, a pad of insulation is placed against the existing wall. When the panel is added, it compresses the insulation increasing stability of the panel, eliminating vibration and providing a finished wall surface.

Conclusion

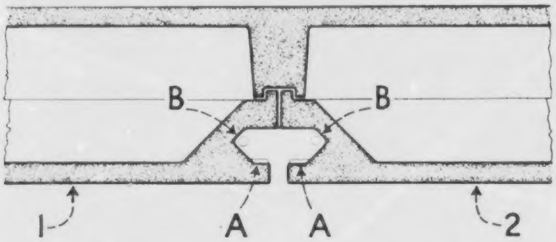
Development of the system to date has been funded by the Educational Facilities Laboratories and the three participating universities. Current budgetary limitations prevent expenditure of additional sums required to complete development work. Essentially, the concept and product appear highly worthwhile but are considerably removed in time from usability. However, plans are being pursued to complete development and marketing of the systems.



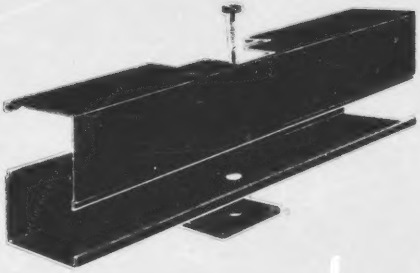
Forty-five feet of shelving, two work surfaces, one pedestal, 30"x30" storage cabinet, 3 file drawers, pigeon-hole unit, 2 six-inch-deep drawers and pencil drawer fit conveniently on one 30"x60" dolly. A second dolly holds all the panels necessary to build the two side partitions for a 120-square-foot office.

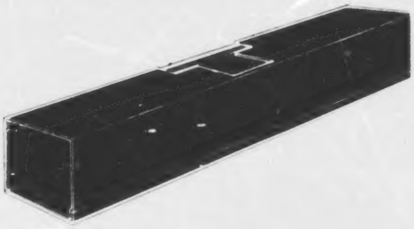


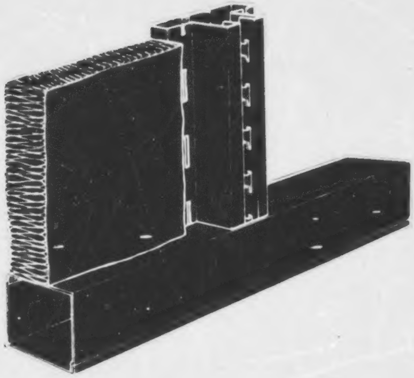
(Left) A finished wall presents a different panel arrangement on each side. The wall on the left shows how the other side of the right wall would appear. In any room, both walls could be similar. Assembly or disassembly causes no appreciable dust, noise or interference with surrounding areas.



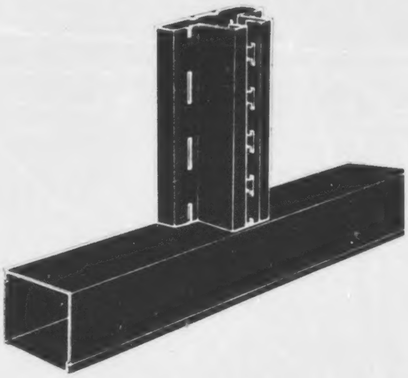
(Above) The channel formed by two panels (1 and 2) butting together contains concealed bracket supports, A, and space, B, suitable for telephone and electrical cord runs. In this space telephone and electrical extension cords can reach any point on the wall, and yet not interfere with the operation of the bracket support system.

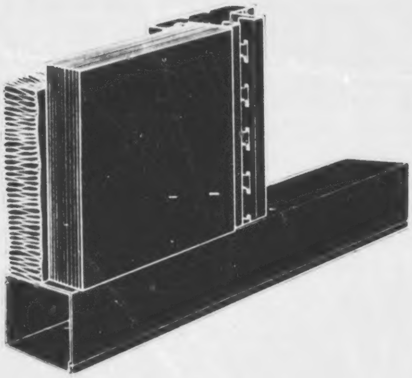




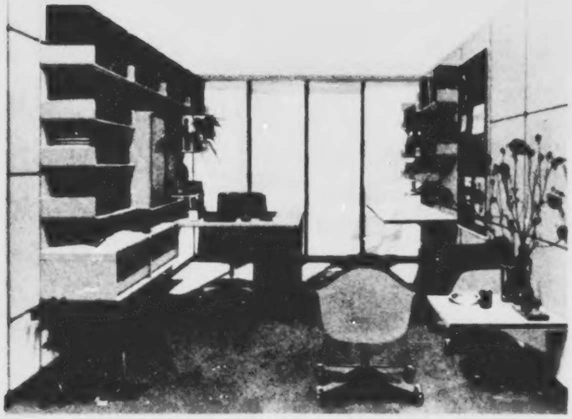


(Left) When wall panels will be used in an existing wall system, a pad of insulation is placed against the existing wall. When the panel is added, it compresses the insulation and increases the stability of the panel, eliminates vibration and provides a finished wall surface.

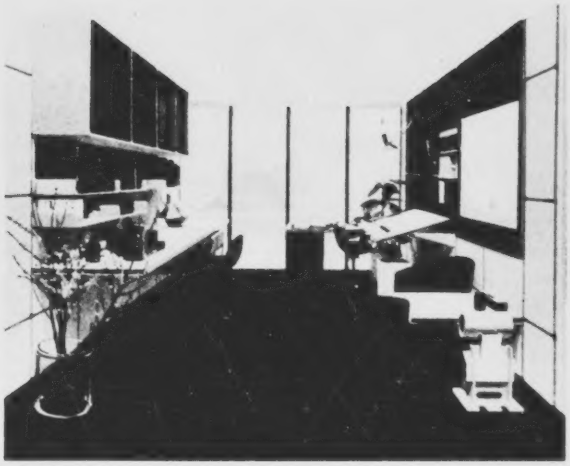




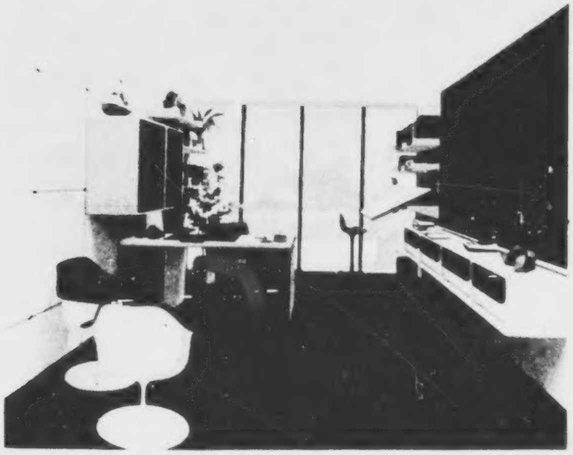
(Left Above) Basic to the system required to hang furniture on an existing wall are floor and ceiling angle components which stabilize and separate (30") vertical studs. Each of these two horizontal members consists of identical L-shaped angles joined together in a configuration different from that used in stud partition. To attach system to existing wall the angles would first be shimmed level and secured in place at points determined by the structural arrangement on the existing wall, or they can be attached to the floor.



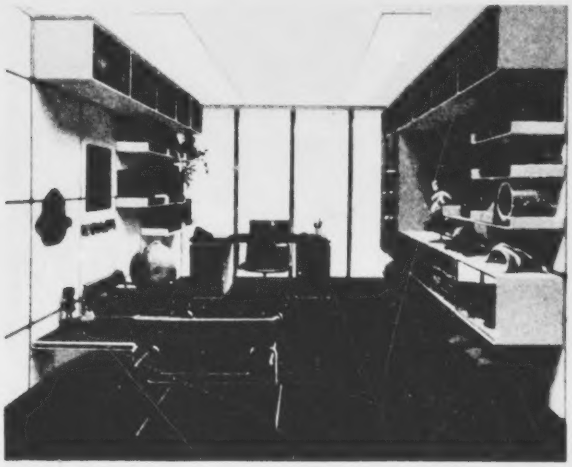
With chairs and personal objects added, the finished office can be as attractive and comfortable as a living room or home library, yet as efficient as a laboratory or teacher's study—all in 25% less space than with freestanding furniture.



The same basic office design can be easily adapted to special requirements such as those of an engineering professor. Wall-hung display units for drawings and maps, bookshelves, storage cabinets, work surface room-length with floor space for extra chairs and a movable tilt drawing board are added. This furniture system could also be adapted for use by an editor or writer.



Physics instructors might find the blackboard, wall-hung cabinets, bookshelves and files suitable to his office needs. Such an arrangement also allows space for conferences with students or fellow teachers.



An archeology professor might find cabinets as high as the ceiling useful for infrequently used materials, while he could display artifacts on tables and shelves, or locked in cabinets with transparent doors.

AIR CONDITIONING-THE AIR SIDE

There is a tendency to identify the air conditioning system by which a campus is cooled by the refrigeration machine used. There is another important aspect of air conditioning systems, the air side, which must also be considered, however. The merits of central chilling versus decentralized chilling is not the point under discussion, but rather that as much thought should go into selection of the air side system as in selection of refrigeration source.

Everybody is concerned about whether to use steam generators, absorption or centrifugal, but they give very little thought to coordination of systems between buildings or even in the same building on another floor. The primary concern is usually the equipment room. If the school is fortunate enough to have a district plant, the engineer who designed it was not necessarily retained for coordination of a secondary system design. In other words, he set up a central station plant but may not have been aware of all the details regarding future additions. He may have had a general idea, but nothing definite was laid out for him. The original designer had to make assumptions about the type of systems to be added later. Changes occur and what was once a fan coil system or an induction system may become a variable volume or floor pipe system in a few years. To insure proper operation of the completed system the original designer should assure all secondary systems will use constant flow variable rise pipe, as that design property will result in a distribution system, equipment arrangement, flow, temperature rise, etc., to serve the extreme situation. On the other hand, if the district plant design group retains, coordinates and designs future secondary systems certain economy could be realized. Planners should follow through with what has been started to provide continuity and to save money. This does not mean necessarily that the physical plant should go out and engage an engineer. Perhaps there is one within the department already, or a consultant or planner could be called in. Whatever action is taken, however, should be consistent.

If the primary flow is substantially constant, and if some secondaries require chilled water at approximately the design temperature regardless of load, then the design engineer should give thought to series arrangements in chillers. Certainly, if a high temperature rise of 15-18 degrees on the primary water is indicated, both these measures will result in operating economy. The secondary design should be coordinated with the initial planning in any case. It is essential in light of some operating difficulties encountered on campuses.

The Air Side

The air side, which directly affects secondary systems, is the part of the system building users–students and faculty–see. It is what they "live" with, while the physical plant's prime concern is the boiler room in the plant itself. The energy crisis and low life cycle cost are specific items which must be considered in choosing an air side unit. Physical plant administrators are well aware of the energy situation and have probably analyzed the situation and perhaps arrived at a solution to fit some energy problems. Many things under physical plant require energy–refrigeration machines, boilers, motors, pumps, etc.–which account for a major part of a campus' energy use.

The term low life cycle cost may need explaining, but once understood it could begin to solve the energy crisis. Low life cycle cost is an amplification or extension of owning, operating and maintenance costs. Low life cycle costs consist of initial cost, interest, insurance, maintenance and energy costs. It is the physical plant administrator's job to employ a type of system which provides the best low life cycle cost. There is a tendency to assume that these five factors remain fairly constant, or at least stable, which may not be the case. Initial air conditioning costs have remained constant or decreased through the years. The cost per ton of refrigeration is less today than it was 25 years ago. Technological advances and greater knowledge of refrigeration systems enable a manufacturer to offset the increased labor and material costs–the major costs for the producer in the last 20 years. A manufacturer owes it to itself and its users to

---

By NED MANN. *The author is the manager for sales training and promotion with the machinery and systems division of the Carrier Air Conditioning Company's main office and manufacturing plant in Syracuse, New York.*

constantly come up with better and more efficient devices. Interest rates have remained stable for institutional borrowers, but have risen slightly over the last decade to keep pace with current dollar devaluation.

Insurance rates have risen slightly, that is, total insurance packages for campuses cost more than before. The total costs have increased, however, because the package is more comprehensive. Insurance rates, like interest, reflect the cost of living rise. Maintenance costs have risen at about the same rate as others—no faster, no slower. The crux of the package is energy costs. Depending on the location and the kind of energy used, costs average 12% higher in the past three years. This trend will prevail for at least three more years, so this is a substantial rise.

Perhaps what makes low life cycle costs more an indicator than just owning and operating maintenance costs is that it also concerns itself with costs of moving in and occupancy changes—additional factors to owning and operating costs. Tenant changes amount to approximately 10% of the original system's cost per year in office buildings. In ten years, changes in occupancy pay for the initial cost of the system. Changes on campus are not as extensive internally as in office buildings, but they do reflect on changes made in various buildings campuswide.

It is important to analyze and compare all air conditioning systems to determine the lowest life cycle cost. Looking beyond initial cost, the kind of building, the people using it and their different needs must be considered. One system cannot be built into every building and meet all the different needs effectively. Any system will "fit" into a building, but it may not be the most efficient one to use. There are four basic types of systems to choose from—all water, air/water, direct refrigerant or all air.

All Water Systems

Every system—two, three or four-pipe—made by any manufacturer has a place on the market. For instance, window units are ideal for cooling a single room. More complex all water systems utilize two, three or four-pipes running from the refrigeration machine, hot water boiler, or into a coil within the conditioned space. Room air is induced into the system, discharged into the room and, if need be, exhaust air, return air or whatever. This is basically an all water system. The cooling medium may be chilled water or some type of brine which is usually supplied from a remote source—a central chiller in the basement, on the roof or in the chilled space itself.

Air/Water Induction Systems

Again, such systems employ two, three or four pipes with the refrigeration machine supplying chilled water through the primary coil, the air following this path through the equipment, mixing with return air, damping, going through a filter; it is then preheated, if needed, drawn or blown through the coil up into the unit in the room (the outlet) with primary air coming up, bringing water through a secondary coil and inducing air across the room across the coil. Primary air and induced room air (at room temperature) mix at various ratios depending on the nozzles (their number and size)—roughly at a 5 to 1 ratio—(for every one CFM of primary air, five are induced).

There are two air/water induction units. One type is water modulated control in which water is brought to the coil. Primary air comes in, is induced and discharged into the room at about a 5 to 1, or as high as a 6 to 1, ratio. The same setup can employ an air bypass control, which instead of controlling flow of water through the coil, controls the flow of air across the coil with a damper in the back which closes and opens depending on the pressure. A continual sampling of room air rises and passes across the thermostat, which controls a bellows and positions the damper to allow all the air to go across it, some to go around it and, if it is in a closed position, all to go around it. In a totally closed position it will merely circulate room air. It is usually in a modulated position in which a mixture of air goes through or bypasses the coil.

The second type is air/water radiant panel with supplementary air. It is essentially the same as the air/water modulated system, except that the outlet is always in the ceiling.

Direct Refrigerant

These systems utilize a self-contained window, wall, roof or floor-mounted unit for extracting or adding heat. Units are normally located within or next to the air conditioned space and consist only of those elements essential to producing the cooling and heating effect. Common types of direct refrigerating systems are:

1. Rooftop units—The type used for small buildings which can be zoned or in single ducts;

2. Through-the-wall-units—In an all air system the air treating and refrigeration plants may be located some distance from the conditioned room in a central station apparatus arrangement. The final cooling/heating medium, air, is brought into the conditioned space through ducts and is distributed within the space through outlets or mixing terminal outlets.

All Air

Common names for some all air types are multizone, double duct, dual conduit, single duct with reheat and single duct variable volume. Certain variations of all air systems can benefit schools by insuring low life cycle costs.

Multizone Air Handling or Rooftop Units: Such systems employ zoning by exposure or by varying air flow on the same exposure depending on size of room, etc. If heating and cooling is done in a packaged piece of equipment, larger capacities can take a built-up system.

Double Duct System: This system utilizes a double duct consisting of one hot duct and one cold duct. Air is brought from the central apparatus, distributed throughout the building, thrown into a mixing box with a series of dampers which vary the flow (as one increases, the hot or the cold, the other decreases) maintaining a constant amount of air.

Dual Conduit: Dual conduit systems are essentially high velocity systems for central air treating plants and apply two air streams to each room in a way not very different from the double duct system. The constant volume of varying temperatures supplying primary air neutralizes transmission gains or losses. In other words, there are two ducts, one of which is on the periphery of the building; this duct is characterized by a constant volume varying temperatures—as outside temperature drops, temperature of the air out of the terminal increases. The secondary stream is a variable volume constant temperature, that is, there is nothing but a cooling load on the interior regardless of the outside temperature. Variable volume constant temperature systems always maintain the same temperature, but will vary in volume. There are air terminal diffusers available which have self-contained, self-balancing and self-operated controls, which are factory installed and calibrated. Physical plant administrators should look for devices which are packaged and calibrated, which work off their own system air and do not require control air.

Single Duct With Reheat: Such systems are of three types. In the simplest unit primary air is brought into the unit and is induced across the coil at a low induction ratio of about 1 to 1 (for every one CFM supplied primary air, one is induced across the coil). This is often a popular terminal for campus classroom use, because it usually features a very strong integral base unit which can take heavy abuse from students who may sit or occasionally stand on the unit. The unit is also acoustically insulated internally to cut down on noise heard in the classroom.

The blow through type works similarily except that the coil is in the air stream, therefore for every one CFM in the unit, one CFM will be produced. The advantage of blow through over single duct reheat system mentioned above is that when the blow through system is shut off hot water can be circulated at night to build up a higher delta-T. The third type is a reheat induction system which has the same configuration as the other two. The air comes in, but the heating coil is in the air stream, so that air is heated before it is induced, therefore heat-induction, rather than induction-reheat. This system will allow the air to go as low as 38 degrees, which can save energy.

Single Duct Variable Volume: These systems have the most to offer in the way of savings of initial costs, energy and low life cycle cost. Four of the five all air systems—multizone, double duct, dual conduit, single duct with terminal reheat—have one thing in common. They tend to waste energy in varying amounts because they first cool the air to some low temperature, usually 55 degrees, and then heat it again at outlets to maintain desired room temperature. Single duct variable volume does not use this reheat method of temperature control, and many different types of variable volume systems are now available. The system's recent renaissance is attributed primarily to new design. Its popularity an be attributed to eliminating major flaws in the system: 1. Dumping air into the room under throttle conditions (dating to the 1920's and 1930's) which, when air was cut down would drop straight down out of the diffuser—50% reduction into the room; 2. Loss of room air motion; and 3. Difficulty in balancing different outlets.

As room loads change the quantity of conditioned room air is modulated in response to room temperature. With the older variable volume system when the lights went out the unit "throttled down," but if the lights in a room were left on, the system would continue to lower the temperature. Conventional outlets, even at best, can be throttled down to only 50-60% of the maximum design CFM. None are available which can improve on that. When throttled further the velocity of the air is reduced and the air drops from the outlet. This results in drafts and poor room circulation. Another problem with conventional outlets served by mechanical throttling dampers is that these devices are noisy. Cutting the damper down makes room noise louder. This increases proportionally with the amount of throttling. Usually with a decrease in room load there is a corresponding decrease in ambiant sound level. Therefore, as loads decrease the air conditioning sound level should drop rather than increase.

True variable volume control cannot be achieved with just any thermal throttling device. There are systems, for example, that keep a constant quantity of air circulating in the building under all load conditions. A true variable volume system not only throttles air into the room, but also reduces the total system CFM. By that is meant that when the load is reduced, inlet guide veins pinch closed lessening the amount of air being released and allowing for a realization of savings. A good system will throttle down to 10% of the designed CFM without dumping or major loss of room air circulation. It could go lower, but there is no need to because regardless of whether the area is occupied or lighted, ventilation is required and 10% is the minimum setting under most codes (CFM per sq. ft. or CFM per student, etc.). In addition, the noise level should decrease.

Variable volume systems employ two internal bellows for air volume control. As the load decreases in the room, the bellows' pressure increases and reduces air flow. This bellows "breathes," taking in air, filling up the bellows and pinching off the air flow (which incidentally cannot be entirely shut off). It can handle interior areas as well as perimeter areas where load variations are the greatest and where throttling 10% of designed CFM is necessary.

Variable volume systems are generally lower in initial cost than other all air systems. The single duct design is simple, easy to install and requires less duct bed. The single duct nomenclature indicates a vast savings in duct work alone. Operating costs of the variable volume system are the lowest of any all air systems with savings of 35% on energy. These systems are best used in buildings with widely varying loads, such as schools, offices, shopping centers, banks, department stores, etc. True variable volume systems offer other advantages when used in modern buildings.

One earlier difficulty with the variable volume system was filtration of primary air. Cheap throwaway filters or even cleanable filters with 25% to 30% efficiency are not good enough to keep the system clean. It is most important that the range of efficiency be between 75% and 85%. This will reduce smudging, which is characteristic of this system. Unless budgetary restrictions absolutely require it, cheap outlets should also be avoided. Service of the system should also be carefully considered. Equipment is expensive and poor service draws complaints from users.

Some buildings require flexibility in meeting changing tenant needs, and one of the biggest stumbling blocks to flexibility is the thermostat. Different comfort requirements of individual users mean constant adjusting and readjusting of the thermostat. Changes in thermostat settings, especially drastic ones, are wasteful. The most efficient method is using a thermostat which is automatically controlled. True variable volume systems have this feature–automatic thermostat control within the unit itself. By using variable outlets with self-contained control, spaces can be changed without the cost of thermostat removal and re-installation. This system will even allow changes to be made while the system is running.

Concerning the trend in the building industry toward modularity, variable volume systems offer the most economical approach to reducing building modifications costs. Variable volume outlets using lineal diffusers installed above a partition, for example, can control the air stream on each side of the partition independently to offer the ultimate in flexibility.

Not only must a system be functional, but it should also have aesthetic appeal. Ceilings are "busy" with sprinklers, Muzak, lights, as well as diffusers. This arrangement need not be unattractive, however. Diffusers can be installed over a partition, or run in a decorative line; they can be as unobtrusive as three inches wide–a far cry from the big round diffuser accepted as part of life.

Summary

This has been a broad review of various types of environmental control systems. To draw comparisons: all air systems are better suited for buildings having relatively low cooling loads. Tall buildings with large glass areas and high lighting loads are more economically served by some type of air/water system of the induction type. Cooling is infinately more economical with water than with air. From the strictly functional standpoint, a single duct all air cooling and reheat system is acknowledged as the best. When discussing operating costs, however, the cooling-reheat system is not necessarily the most efficient.

The best system for a particular application should be selected after analysis of all factors, functional and economic. It is possible to set a few guidelines which can be used in the selection of the proper system. Systems selection should be based on factors such as: function, building height, glass ratio, building loading (BTU's per sq. ft.), orientation of building, operation (24 hours, 12 hours, 8 hours), energy source available, initial costs, operation costs, space requirements and maintenance.

SEX OF OSHA

Introduction

Whatever its gender, "OSHA Labor" was spawned the 29th of December, 1970 and came into being April 28, 1971. The proud parents—"Unionus Labor" and "Governmentous Labor". All have concluded it is here to stay, and all must learn to live with the law and the influence it has on operations.

Because of the law's complexities, there has been much written about it. The total capabilities are still being defined and modified by those caring for its growth and development.

Its influence and impact are met with varied reactions: "The intent and purpose of the law is commendable," stated Representative William Hungate (D-Mo.) in announcing hearings on the impact of OSHA. "But like so many other good laws passed by Congress, federal bureaucracy sometimes manages to complicate matters by establishing harsh and irrelevant rules and regulations."[1]

Testimony given by safety expert and architectural engineering consultant Lewis Barbe before the House Committee on Education and Labor indicated "There is the matter of exorbitant costs for foolish and unnecessary (compliance) which has nothing to do with safety, e.g., 'every water closest shall have hinged open front seats.' There are 15,000,000 toilet seats in the U.S., 8,000,000 of which have to be changed at a cost of $30.00 per seat or $240,000,000." Concerning standards—only 50% of the standards needed to comply with the law have been made available. He further asserts that OSHA inspectors and labor unions work hand-in-hand to "blackmail" management. Mentioned was a case where an "OSHA inspector sat outside the company where a union representative negotiated an increase in pay due to violations within the plant. The labor boss walked away with a 15% pay hike."[2]

In an article written by Peter A. Cockshaw in the July/August issue of *Industrial Construction Magazine*, Cockshaw stated: "The OSHA 'policemen' enforce the laws without search warrents and issue citations and self-executing penalties. The employer must take the offense to appeal the citations and penalties to prove himself innocent—not through the courts—but only through an OSHA police commission in Washington; only after the commission makes a decision does an employer have a limited right to go to an appellate court.

"In short, OSHA: 1) imposes penalties on the employer without the procedural safeguards guaranteed by the due-process clause of the Fifth Amendment; and 2) denies the right to trial by jury and the right to face one's accusers both guaranteed by the Sixth Amendment."[3]

Gerald L. Holmes, OSHA compliance officer for southern California, stated at a meeting of the Ventura Chapter of the American Institute of Plant Engineers: "There has been a great deal of misinformation and misconception about OSHA; compliance can be achieved merely by adopting 'common sense' safety practices which is 'good business' anyway; (however) OSHA (is) another 'bureaucracy' subject to the whims of the bureaucrats. (The) intent of the OSHA program is 'volunteer compliance'".[4]

There is no question that the law and its implementation are having growing pains. Adolescence is difficult for most and considering the lack of proper preparation for this ill-planned child, the current developmental period should not be too great a surprise. Until OSHA too little was done, too long; and now there is too much, too fast.

By GENE B. CROSS. *The author is Assistant Vice President-Maintenance Center at the University of Delaware and was formerly Assistant to the Administrative Vice President and Director of Environmental Health and Safety at the University of Utah. He is currently serving his second term on the APPA Board of Directors and is the Association's Vice President for Professional Affairs. Cross has a BS degree in business management and an MS in educational administration from the University of Utah and is working on his doctorate.*

The Law—Why It Is Needed

In spite of all the criticism, satirical objections and legal rebuttals, the Williams-Steiger Occupational Safety and Health Act of 1970 is a well-intentioned law. Former Secretary of Labor, J.D. Hodgson stated, "The purpose of this landmark legislation is to assure safe and healthful working conditions for the nation's wage earners. The law provides that each employer has the basic duty to furnish his employees employment and a place of employment free from recognized hazards causing or likely to cause death or serious physical harm."[5]

"Statistics on industrial accidents and health hazards make a strong case for federal intervention. Each year 14,000 workers died and 2.2 million were disabled by accidents in the workplace," former Labor Secretary George P. Shultz testified during the Senate hearings.[6]

Work-related deaths and accidents meant estimated annual losses of $1.5 billion in wages and $8 billion in the gross national product. In industrial accident statistics compiled by the Department of Labor included nondisabling serious accidents accounting for less than a day's work, yearly totals would be 25 million, rather that 2.2 million injuries.

New dangers posed equally complex problems. The Public Health Service estimated that a new, potentially toxic chemical was introduced into industry every 20 minutes.

> In 1971, 51,229,000 people were injured in the U.S. 11,200,000 of these injuries were disabling and 115,000 died a violent death as a result of the accidents! It is estimated that the direct cost of accidents in 1971 was $29.5 billion dollars. The indirect and uninsurable cost is estimated to be between four and ten times this figure. Accidents in the work place in 1971 killed 14,200 persons, disabled 2,300,000 and cost $9.3 billion dollars. On-the-job fatalities decreased by 1% in 1971.[7]

Something had to be done.

To Whom The Law Applies

OSHA applies to almost everyone! "The law is one of the most far-reaching passed in the last few years. It applies to every employer engaged in a business affecting commerce."[8]

"All workers are covered by the interstate commerce clause of the U.S. Constitution. There is hardly any industry that can be excluded from this category. If you receive products across a state line, or deliver them, you're involved in interstate commerce that includes the local butcher and grocer and everyone else. State, county, city, local government employees are exempt."[9]

Mr. Fred M. Bishoff, director, Compliance and Standards Programs Occupational Safety & Health Administration, U.S. Department of Labor stated, "The Act covers all the employees in approximately four million establishments, about 60 million people. It covers federal employees but not state and local municipal employees."[10]

Some educators might think, "It surely couldn't apply to an educational institution because we're not engaged in interstate commerce in any way, and besides state and local governments were excluded and we're a state-supported school."

However, the interpretation relies on the broad definition of interstate commerce. "At a recent meeting, an OSHA inspector stated that if any material or equipment used by an employer came from another state he is involved in interstate commerce."[11] An apartment house owner questioned if his building came under the law. After a rather thorough review of his operations, it appeared he would be exempt, until they asked him if he had a telephone switchboard in the building. He replied that he did. "Do you ever accept long distance calls from out of state?" he was then asked. The affirmative answer to that question brings educational institutions under the law.

What about state exemption? "Agencies of state and local governments are excluded from the definition of employer under the act. But this does not mean that the agencies have no obligations under the Act."[12]

"There is no general pre-emption under the Act. Instead, there is a sharing of responsibility for the issuance and enforcement of safety and health standards."[13]

What this means is that states can, and it is the intent of the federal government that they should, develop their own safety and health program equal to or exceeding the OSHA program. A system is set up in the Department of Labor with which states file their programs, and federal funding is available to assist states in implementation of their programs. OSHA anticipates 30 state plans will have been submitted for approval by June, 1973.

Private schools certainly come under the act, as they are considered along with other 'establishments' engaged in interstate commerce. The act applies to all schools of higher education even though they may not have been inspected yet. There is a possibility many schools will not be approached for years. In fact, target industries—marine, roofing, sheeting, meat and meat products, lumber and miscellaneous transportation—and leading priorities—asbestos, carbon monoxide cotton dust, lead and silica—get 70-90% of the inspections. There is no room for complacency, however. It is better by far to "Be prepared".

Resource Material Needed; Acquiring It; Staying Current

The first step toward compliance is getting informed, now! Get in touch with the regional or area OSHA office. There are 10 regional offices (locations listed in the appendix). Some regions have satellite area offices, and information on them is available at the regional offices.

One word of caution. *Do not* invite OSHA people to come to the school for a meeting or visit. If they come to a facility, they are required to inspect and issue citations if they observe violations.

The basic published material available that all should have to keep informed is:

1. The law
2. *Recordkeeping Requirements*
3. *Compliance Operations Manual*, January 1972
4. *Federal Register*, Vol. 36, # 105, Saturday, May 27, 1971 "OSHA Standards, National Concensus Standards and Established Federal Standards."
5. *Federal Register*, Vol 37, # 202, Wed., October 18, 1972 "Occupational Safety & Health Standards"
6. *Federal Register*, Vol 37, # 243, Saturday, December 16, 1972 "Safety and Health Regulations for Construction"

Two other publications that could be helpful are:

1. *Inspection Survey Guide*, Bulletin 326
2. *Job Safety and Health Act of 1970* (book), by the Editorial Staff of the Bureau of National Affairs, Inc.

The *Inspection Survey Guide* has recently become obsolete. If used as a guide rather than as an authority, it could also help, however.

Job Safety and Health Act of 1970 is worthwhile because it analyzes the act and has dialogue and explanation of its more important sections.

One other important recommended supplement is "100 Questions and Answers About OSHA". (OSHA 2013) It is informative about developments and implementation of the act.

Most, if not all, this resource material can be acquired from area or regional offices. The original source of most of the documents is the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. If the documents are acquired from the Printing Office, in lieu of area or regional offices, the fee for them will be approximately $2-3.00 per publication.

It is not only important to be well-informed on current status, but it is equally important to stay current with changes and interpretations of the law, which are modified constantly. For instance, the authority to issue standards through the "National Consensus Standards" ends April 28, 1973.

Special groups within the OSHA Office of Safety and Health Standards have been busy updating and drafting new authoritative standards. These are published periodically, as promulgated, in the *Federal Register*. For example, Vol. 27, # 202, Wed. Oct. 18, 1972 sets down the "Occupational Safety and Health Standards"; Vol. 37, # 243, Sat., Dec. 16, 1972 sets down the "Safety and Health Regulations for Construction." Both of these are valuable.

To stay completely current on development of the act and its standards, subscription to the *Federal Register* is recommended (U.S. Government Printing Office, Washington, D.C., 20402 - cost $25.00/yr), as well as to the *Safety Standards* magazine ($1.00/yr), the official publication of the Occupational Safety and Health Administration. Many other commercial publications and consulting firms are also readily available.

Not many educators feel the need to stay completely current on the program. With its magnitude and developmental character, it takes a good-sized staff to keep up-to-date with the program. Most physical plant departments meet their needs by assigning at least one employee responsibility for the program; he then works with the campus department responsible for the program at the school. This usually is the Personnel Department. Subsequently they should have copies of the *Federal Register*, as well as the *Safety Standards* magazine and other appropriate publications provided by the area or regional office.

Forms, Records, and Posting Requirements

There are forms, records and posting requirements outlined in the previously mentioned publication, "Recordkeeping Requirements under the William-Steiger OSHA Act of 1970". It contains a centerfold poster required for display in a prominent place in the "establishment" to which the employees normally report to work. How many are put up and where is an individual decision or one to be worked out with the local OSHA office. What constitutes an "establishment" in the preceding statement is vague in the available literature.

If no poster is up, nor log kept of recordable occupational injuries and illnesses, nor "supplementary records of each occupational injury or illness" since July 1, 1971, the establishment is subject to a citation and fine.

> Every employer must keep the records up to date, have them available to government representatives, and post a summary of all occupational injuries and illnesses at the conclusion of the calendar year. In addition, employers must report to the Secretary of Labor within 48 hours each accident or health hazard that results in one or more fatalities or hospitalization of five or more employees.[14]

The "Secretary of Labor", in this instance, means his local representative—the regional OSHA officer. The "Summary of all Occupational Injuries and Illnesses" is a third report form required—completed at the end of each calendar year prior to February 1st and posted for at least 30 consecutive days.

The area of Records and Posting Requirements is the most imminent and should take priority. Other records, such as your own inspections should be kept also.

Fines and Penalties

If cited for noncompliance with recordkeeping and posting requirements, the fine is up to $1,000 for each violation. Employers are extremely vulnerable as employees can purposely or inadvertently bring the violation to the attention of the local OSHA office by merely writing them and asking why this information is not available to them at their work "establishment". The inspector could then check for that violation and all others covered under the act.

Example: An employee of a hospital complained to the OSHA inspector of inadequate lighting in the parking lot. Upon inspection no citation was issued for the lighting, but the inspector surveyed the hospital and cited 25 other alleged violations ranging from a $35.00 penalty for improperly spliced electrical wiring on a floor washer to an $85.00 penalty for electric kitchen equipment under repair without use of a lockout and notification tag.

Those small dollar amounts are misleading, for the penalty structure can be severe. For instance:

> Willfully or repeatedly violating standards under the Act—not more than $10,000 for each violation;
>
> Failing to correct a violation, for which a citation has been issued within the period permitted for its correction—not more than $1,000 for each day during which such failure or violation continues;
>
> Willfully violating any standard rule, order or regulation under the Act that causes death—an employer shall, upon conviction, receive a fine of not more than $10,000, or imprisonment for not more than 6 months, or both. A second conviction would double the penalty;
>
> Giving advanced notice of any inspection—fined not more than $1,000, or imprisoned for not more than 6 months, or both;
>
> False statements, representation, or records—fine of not more than $10,000, or imprisonment for not more than 6 months, or both.
>
> In case anybody gets mad enough to take it out on the inspector: For killing a person engaged in investigation, inspection or enforcement—punishment by imprisonment up to life.[15]

In the main, however, fines have averaged moderately at around $100.00 per citation.[16] OSHA inspectors have been very active though.

Bishoff pointed out, "(covering the period July 1971 through March 1972) OSHA conducted 22,868 inspections, in 20,688 establishments, employing 4,064,205 workers. During those inspections we found 63,573 alleged violations of our national safety standards, and we issued 16,370 citations. It is encouraging to note that about 23% of the establishments we inspected were in compliance with the national safety standards. As of April 1972, 732 of the citations had been contested. The penalties we proposed total $1,444,686."[17]

He further mentioned that "OSHA has four inspection priorities: (1) investigation of catastrophes and accidents resulting in a death or hospitalization of five or more workers; (2) employee complaints; (3) special programs, namely, the Target Industry Program and the Target Hazard Program, (which were mentioned earlier in this presentation); and (4) a cross-section of general industry."

Two inspection areas under fire are #1 and #2 above. A fatal or serious accident at a school is likely to be inspected. Likewise, if employees report unsafe conditions, the OSHA inspector will pay a visit, unannounced with full authority of access and issuance of penalties.

All is not lost however, just because the inspector issues a citation. As mentioned earlier, the standards and their interpretation are not well-defined in many areas of the law. Therefore, much is left up to the inspector, his mood and impressions. The employer does have the right of appeal. This must be done within 15 working days from the date of citation, in writing to the district office.[18]

Many employers are taking this route. In the June '72 *OS&H Review Quarterly Report*, published by the American Society for Personnel Administrators, it said nearly 900 employers had contested charges brought against them and of 88 cases decided, the penalty proposal had been modified in 58% of the cases. Forty-three percent being reduced and

15% increased. The sword can cut both ways.

The appeal process can proceed into the courts via the regional administration, to the commission and finally to the U.S. District Court of Appeals. A host of small penalties have been dismissed because OSHA cannot afford the legal staff or the expense of tieing up inspectors in court.

What about the employee's responsibility to uphold OSHA regulations after he has been properly informed and trained? To quote the law, "Each employee shall comply with occupational safety and health standards and all rules, regulations and orders issued pursuant to this Act which are applicable to his own actions and conduct."[19] Do not be misled by the seeming implication of this statement, however. All the literature on this point makes it very clear that the employer has the prime responsibility over the working environment and the worker. An OS&H Administration publication queries: "Q. If employees willfully do not use proper equipment or follow prescribed safety rules, will the employer be relieved of possible penalties? A. The Act contains no provisions for relieving employers of penalties in such cases. However, the penalty may be reduced it it appears the employer has made a good-faith effort to comply."[20]

This leaves little doubt that the intent of the Act is to place the burden of compliance squarely on the employer even to the extent of insuring that the employee complies with the law. The courts have shown signs of being more understanding in reviewing appeals, however, and have given relief to the employer where it was obvious he had fulfilled his responsibility and the negligence was on the part of the employee. Employees need to be properly informed of what can or cannot be done. "You had better have the safety orders in print and proof that the employee had been made aware of his safety responsibilities."[21]

You will get no help from the Labor Department in releasing a man for not complying with the Safety and Health Regulations. In such cases, an employer would be expected to follow normal disciplinary procedures for an employee who violates work safety orders.

"The Act contains no penalties for workers who, although required to follow the law, fail to do so. Labor Department officials admit that an employer may be put in jeopardy by a worker who refuses to follow safety law requirements, even though ordered to do so by his boss."[22]

With a well-outlined program, backed up with informed, conscientious supervision, an establishment can fall within the 23% inspected which were found in compliance. An employee can and should be released if after a thorough knowledge of his safety and other responsibilities, he ignores them. Be sure to document his training and infractions, and there will be no problem. It takes more administrative time and paperwork but as mentioned earlier, the Act appears to presume guilt until proven otherwise. This requires sound procedures and documentation.

Current Trends and Basic Do's and Dont's

The act and its implementation are going through an adolescent growth and development period with changes occurring almost daily. Some current trends indicate:

More than 100 Congressmen have sponsored amendments to the Act.[23] Their chances do not look good, however;

The Act has been interpreted to apply to all levels of employees.[24] The traditional distinction between employees exercising supervisory functions (exempt) and those who do not (nonexempt) does not apply under this law;

A current ruling, under appeal by the union, stated the company was not guilty of discrimination against its employees in refusing to pay them for time spent on the walk-around (inspection). All that is required of the employer is that he permit the employee representative to be relieved of his usual production duties during the inspection;[25]

Phoney OSHA inspectors have also cropped up. Some are for industrial espionage. More commonly the imposter has been followed in a few days by a salesman who just "happens" to have the safety equipment the employer was "ordered" to provide. Bona fide OSHA inspectors carry a photo ID with them, which employers should insist on seeing;[26]

The new Secretary of Labor, Peter J. Brennan, former president of the New York Building and Construction Trades Council, should be watched to see his position on OSHA;

State Plans have been received from 19 states (Dec. '72) and Puerto Rico. Virtually all states have advised OSHA of their intent to submit plans. Check with your State Industrial Commission to see how your state is coming;[27]

Assistant Secretary of Labor for OSHA, George G. Guenther, announced a second reorganization of OSHA during a November press conference. Emphasis will be on training efforts and standards development;[28]

In Hawaii a sample of 5,000 employers has been asked to respond to questions relating to job injuries and illnesses in a survey conducted by the Bureau of Labor Statistics. Results will be released in July or August '73.[29]

OSHA Do's and Don'ts

Don't

1. Wait until inspected to start a program.
2. Invite an OSHA official onto campus.

Do:

1. Get informed!
2. Know the act, the standards, their current changes.
3. Acquire the "Recordkeeping Requirements" publication, display the poster and commence reporting and recordkeeping system.
4. Develop a safety library of pertinent literature.
5. Subscribe to an appropriate publication to keep informed.
6. Designate one staff member to be the authority and coordinator of the program. Have him work closely with the school's personnel department.
7. Conduct a safety inspection program in accordance with OSHA standards.
8. Keep lines of communication open with all personnel through a safety committee on other means.
9. Keep abreast of development of applicable plans.
10. Consult with OSHA officials but not at your "establishment".
11. Inform the school administration of the act and its implications and importance. Their support is necessary for compliance, funding and protection of the entire university's operation.

NOTES

[1] "Occupational Hazard: Keeping Up With OSHA," *Actual Specifying Engineer*, (Nov. 1972) pp. 53-66.

[2] "Administration of OSHA 'A Mess' Expert Charges in House Hearings," *Architectural News*, Vol. 7 # 6 (Oct. 1972) pp. 1&3.

[3] Peter A. Cockshaw, "The OSHA Policeman," *Industrial Construction Magazine*, Vol. 4 # 6 (July/August 1972).

[4] "OSHA NOT TO BE FEARED: Says Compliance Officer," AIPE Newsletter (Dec. 1972) pp. 13.

[5] "Recordkeeping Requirements Under the Williams-Steiger Occupational Safety & Health Act of 1970," U.S. Department of Labor Occupational Safety and Health Administration.

[6] 1971. The Job Safety And Health Act of 1970. The Bureau of National Affairs, Inc., Washington, D.C.

[7] Lawrence P. Sands and Robert L. Wilson, "OSHA Info," *Masonry*, Vol. 12 # 10, (Oct. 1972), pp. 11.

[8] Op. cit., *Architectural News*.

[9] Dr. Thomas H. Rockwell, "The Occupational Safety & Health Act: How It Affects ASHRAE," *ASHRAE Journal*, (Dec. 1972) pp. 50-53.

[10] Fred M. Bishoff, "The Impact of the Occupational Safety & Health Act," *Fire Journal*, (Sept. 1972) pp. 32-34.

[11] Gary L. Robinson, "OSHA And You," *Heating/Piping/Air Conditioning*, (Sept. 1972) pp. 82-88.

[12] Op cit., The Job Safety and Health Act of 1970.

[13] Ibid.

[14] Op. cit.,"Recordkeeping Requirements Under the Williams-Steiger Occupational Safety & Health Act of 1970."

[15] Op. cit., The Job Safety And Health Act of 1970.

[16] "Occupational Safety & Health Review," Quarterly Report to Members, American Society for Personnel Administrators, (Dec. 1972).

[17] Op. cit., The Job Safety And Health Act of 1970.

[18] Ibid.

[19] Ibid.

[20] "100 Questions and Answers About OSHA," Occupational Safety and Health Administration, U.S. Department of Labor (1972).

[21] Virgil E. Strong, "It's Ominous, It's Titanic...It's the Law. The Occupational Safety & Health Act," *Pest Control*, (June 1972) pp. 15-18.

[22] Ibid.

[23] "Occupational Safety & Health Review." Quarterly Report to Members, American Society for Personnel Administrators, (June 1972).

[24] Ibid.

[25] Ibid.

[26] Ibid.

[27] Op. cit., Quarterly Report to Members, American Society for Personnel Administrators, (Dec. 1972).

[28] Ibid.

[29] Ibid.

BIBLIOGRAPHY

"Occupational Hazard: Keeping Up With OSHA," *Actual Specifying Engineer*, (Nov. 1972) pp. 53-66.

"Administration of OSHA 'A Mess' Expert Charges in House Hearings," *Architectural News*, Vol. 7 #6 (Oct. 1972) pp. 1&3.

Peter A. Cockshaw, "The OSHA Policeman," *Industrial Construction Magazine*, Vol. 4 #6 (July/August 1972).

"OSHA NOT TO BE FEARED: says Compliance Officer", AIPE Newsletter, (Dec. 1972), pp. 13.

1971. The Job Safety And Health Act of 1970. The Bureau of National Affairs, Inc., Washington, D.C.

Lawrence P. Sands & Robert L. Wilson, "OSHA Info," *Masonry*, Vol. 12 # 10, (Oct. 1972), pp.11.

Dr. Thomas H. Rockwell, "The Occupational Safety and Health Act: How It Affects ASHRAE," *ASHRAE Journal*, (Dec. 1972) pp. 50-53.

Fred M. Bishoff, "The Impact of the Occupational Safety and Health Act," *Fire Journal*, (Sept. 1972) pp. 32-34.

Gary L. Robinson "OSHA And You," *Heating/Piping/Air Conditioning*, (Sept. 1972) pp. 82-88.

"100 Questions and Answers About OSHA," Occupational Safety and Health Administration, U.S. Department of Labor (1972).

"Recordkeeping Requirements Under The Williams-Steiger Occupational Safety and Health Act of 1970," U.S. Department of Labor Occupational Safety and Health Administration.

"Occupational Safety & Health Review," Quarterly Report to Members, American Society for Personnel Administrators, (Dec. 1972).

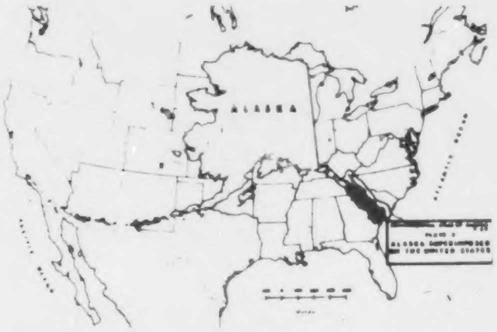
Virgil E. Strong, "It's Ominous, It's Titanic...It's the Law. The Occupational Safety and Health Act," *Pest Control*, (June 1972) pp. 15-18.

"Occupational Safety and Health Review," Quarterly Report to Members, American Society for Personnel Administrators, (June 1972).

PEARL HARBOR CRUISE—Aboard the good ship Adventure V, APPA conventioners experienced a memorable tour of U.S. Navy ships and facilities on this quiet Sunday afternoon. The atmosphere became even more subdued as they passed the memorials constructed over ships destroyed that fateful December 7, 1941, that launched America's entry into World War II.

UBBISH
ONLY
BISH
OVENTURE V
ADVENTURE V

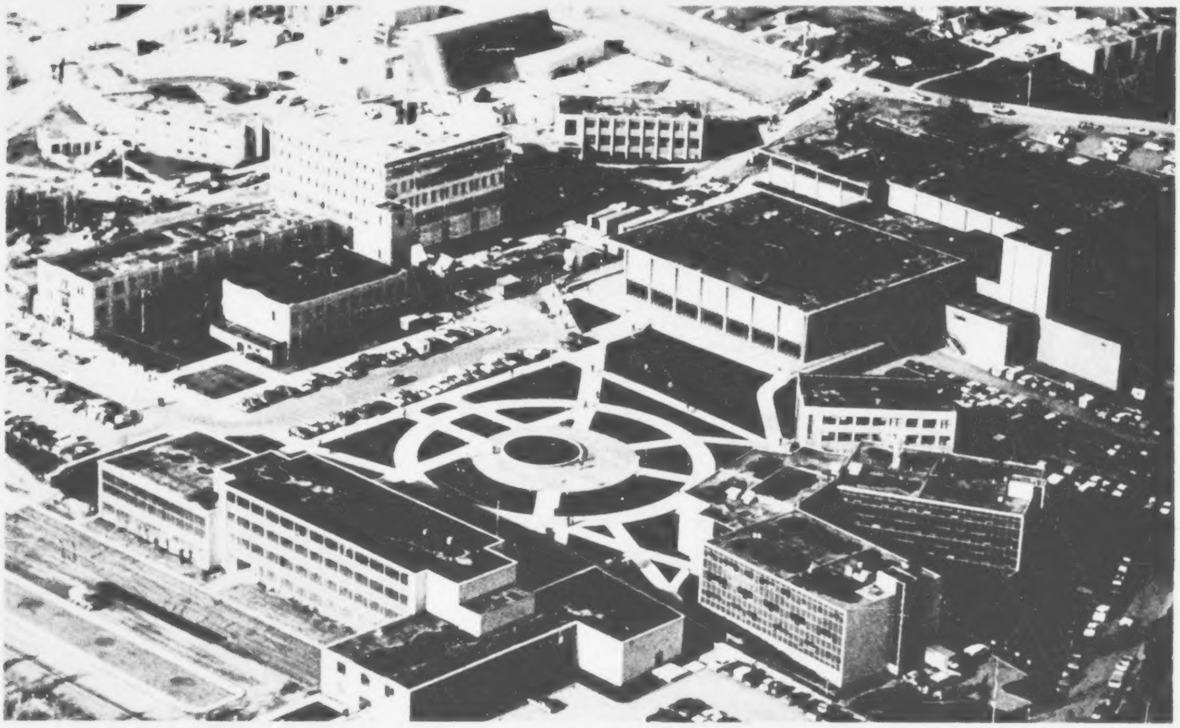
THE ALASKA STORY



(Above) Superimposing a map of Alaska on one of the contiguous 48 states graphically illustrates their relative sizes. The state has more miles of coastline than all the other states combined and is as large as the 21 smaller states. Statewide there is a time zone spread of five hours, with islands in the western Aleutians being closer to Japan than to Fairbanks.

(Right Above) Richard V. Moriarty is director of physical plant at the University of Alaska/Fairbanks, a member of APPA and of the Pacific Coast Region of APPA. A graduate of the University of Alaska with a degree in civil engineering, he is a member of the American Society of Civil Engineers. Before his employment with the University, Moriarty worked as an engineer and manager in the construction industry in Alaska. He is a native of Sioux City, Iowa.

(Below) Pictured is an aerial view of the core campus of the University of Alaska/Fairbanks. The University has an unusual amount of floor-space—40 main buildings covering 1.6 million square feet—for its student population.



A highlight of the Annual Meeting program was the slide presentation by Richard Moriarty on the University of Alaska/Fairbanks. As director of physical plant at the University, he was able to acquaint APPA members with the region and its unusual physical plant problems. Alaska is a state of extremes—in population (lowest density per square mile), weather (and temperature) and size. In an effort to nullify these extremes the physical plant and the university experiment—thus, the University has an air-inflated hockey dome/tennis court and modular housing and is testing the Irma roofing system among other things. Research carried on by the University accounts for more than 50% of the annual budget and involves agricultural experimentation (developing new crops and exploring methods for increasing productivity of established ones), animal research (mink, fox and other fur animals) and wildlife studies. The University also supports Institutes in Arctic Biology, Arctic Environmental Engineering, Marine Sciences and Geophysics.

ELECTRICAL EQUIPMENT PREVENTIVE MAINTENANCE

Understanding plant equipment, increasingly complex as a result of technological advances, points to the need for focus by management on professional maintenance.

Neglected plant equipment can have severe consequences. It takes only one failure to exceed all costs of properly maintaining equipment, and maintenance investments will assure optimum performance of equipment in the future.

With the exception of rotating equipment, most electrical components are static–the real cause of problems. Circuit breakers carry current passively; if they fail when called upon to do their job, it is too late. Consider how often maintenance crews operate or have breakers tested and calibrated. Transformers also appear passive but without proper maintenance are potential failures.

Equipment owners often say, "I always buy the best equipment to assure reliability," without realizing that even gold-plated electrics, regardless of the vendor, can fail if not properly maintained.

Maintenance planning is the most important consideration, and it should be given priority. A prime consideration should be use of either in-house or contract maintenance, considering costs, manpower resources and available equipment.

Several plans are available:

1. Total in-house maintenance;
2. In-house maintenace utilizing subcontractors as needed;
3. In-house labor utilizing vendor technical direction;
4. Total contract maintenance.

Consideration in each category must be made regarding available manpower resources, training facilities, varying maintenance loads and total environmental costs.

Ideally, in-plant maintenance organization is the best, however, it is also costly, especially for a small facility. Turnover of personnel can erase expensive efforts to build a competent organization. With increasingly more complex equipment, maintenance training becomes outdated rapidly without proper, often expensive, training.

Benenfits of small in-house crews, utilizing outside maintenance personnel for emergencies and peaks, are excellent. Small in-house crews optimize effectiveness (prevents nuisance calls), yet provide responsiveness when needed.

Most large electrical manufacturers have their own field engineering organization which provides an excellent place for the maintenance manager to purchase technical direction. These vendors provide professional field engineers who handle plant maintenance problems and supervise corrections. This service is purchased for $25 to $30 per hour. The real benefit is that a field engineer from a large manufacturer is backed by the resources of the company, including application engineering, design engineering and research and development in all fields.

A fourth consideration is total contracting of maintenance labor and supervision. Many plants utilize this technique successfully. The advantages are generally lower overall maintenance cost, well-trained manpower and unlimited support; while the disadvantage is a tendency for lack of loyalty to the company by employees.

The functions of a maintenance organization, regardless of type, are similar and cover a broad scope. Generically, these consist of complete installation, installation support, complete maintenance, maintenance support, training,

---

By R.L. GOLDEN and GRANT NIVER. *Mr. Golden is the service supervisor in the Installation and Service Engineering Department of the General Electric Company's El Monte, California office. Mr. Niver is also with General Electric in its San Francisco office.*

vendor complaint and warranty administration, spare parts logistics and inspection. In larger plants, the groups are sometimes broken down into separate construction installation and maintenance groups. Usually, maintenance groups are the most highly trained.

Since maintenance costs are a heavy expense for a business or production facility, it is imperative that attention be focused on the efficiency of the maintenance operation. There are several reasons for this, among them that maintenance dollars are easily spent, but often hard to justify to management. As a corollary, maintenance dollars improperly spent resulting in equipment outages or shutdowns lead to criticism from management. The concept of auditing maintenance efficiency is planned to determine where maintenance dollars should be spent to provide the most reliability at minimum cost.

Toward this objective the maintenance manager should bring technical skill and know-how to bear on maintenance practices with emphasis on determining what maintenance areas should receive most emphasis and which should be treated less emphatically.

The basic problem in any economical maintenance program is determining which equipment or devices effort should be expended and when. This naturally leads to questioning life expectancy of particular equipment.

Most plants contain an assemblage of electrical apparatus requiring a variety of maintenance techniques. To further complicate the problem, identical or similar equipment may vary widely in age. Furthermore, the application of this equipment varies widely.

The first step in auditing maintenance practices and efficiency is to sort equipment into categories by type, age and application. Then it is possible to study each category separately. The next step is determining the specific technical conditions of each category of equipment.

Once the condition and priority have been established, the maintenance cycle should begin by upgrading the system to reliability standards acceptable to the plant. During this phase, it is usually wise to have the manufacturer's field engineer present on large equipment during field work and maintenance to assure work performed according to factory specifications and recommendations. A few dollars spent in this way is excellent insurance.

Selective maintenance procedure should then be established specifying frequency of maintenance, maintenance practices, standards and records. The plan should be followed explicitly to assure optimum performance of all equipment.

Correction of warranty on new equipment is 100% the supplier's responsibility. However, between supplier and user are services such as installation, inspection and instruction of customer operating and maintenance staffs. The benefits for using vendor field inspectors for these interim services should be evaluated. Assurance that equipment has been properly installed can eliminate problems occurring long after the equipment warranty has expired.

Maintenance training is another important function commonly overlooked. Large electrical manufacturers and other organizations now offer moderately priced maintenance seminars and extensive in-house training courses. Maintenance training is no longer left to intuition. Men must be trained and retrained. Operating personnel and supervisors must also be trained to recognize when need for preventive or corrective maintenance arises.

Complementing maintenance auditing is identification and ordering adequate spare parts. Equipment manufacturers can be helpful in recommending spares, but historical data and experience will probably prove most valuable.

Another reason making proper maintenance mandatory is OSHA, which firmly enforces regulations. Maintenance managers should make certain their areas of responsibility adhere to these safety regulations.

Electrical Equipment Preventive Maintenance

In order to stimulate thought about electrical equipment preventive maintenance, consider the following questions:

1. What will an effective preventive maintenance program do for a particular facility?
2. Where can professional maintenance assistance be obtained?
3. What electrical equipment should get maintenance priority?
4. How can management upgrade and train maintenance personnel?
5. What maintenance tasks should be performed on electrical equipment?
6. How often should equipment be inspected and serviced?

Questions of this nature must not go unanswered if equipment is to be properly maintained. For those unable to answer these questions, exploring preventive techniques and identifying maintenance priorities for in-plant electrical equipment may be necessary.

Every organization, large or small, has to maintain electrical equipment—usually within a specified budget. With shrinking budgets it is increasingly important to achieve the best equipment maintenance efficiency. That is, maintenance money is harder to come by, so it is essential to spend the available dollars in a manner planned to obtain the greatest value for the expenditure.

In order to accomplish this, every maintenance organization must understand what kind of maintenance should be performed on electrical equipment and exactly how often. Innovation in electrical equipment preventive maintenance development of tentative guidelines for a maintenance program will require review of professionally acceptable preventive maintenance techniques and tasks.

In general, if mechanical equipment is not properly maintained failure will usually result in stopped production or equipment rendered unusable for some time. However, this is not true with electrical equipment. If it is not properly maintained the consequence can be complete destruction of the electrical equipment itself and surrounding equipment. It can result in electrical fires that are extremely difficult to extinguish or critical injury to operating personnel. Because of this, it is desirable to engage in a professional approach to preventive maintenance of electrical equipment—especially in areas of high voltage equipment rated at 2400 volts and above.

Outlined below are general considerations for developing a maintenance program and procedure suitable to equipment needs.

I. *Power and Distribution Transformers (Liquid Filled)*

A. Transformers are perhaps the most abused electrical equipment. They perform without visibly moving parts and continue to meet energy demands without signs of protest. However, something may gradually be deteriorating inside the transformer, resulting in a serious electrical failure or explosion. In general, liquid-filled transformers can be adequately maintained by:

1. Inspecting low voltage and high voltage bushings and cooling tubes regularly for oil leaks;

2. Wiping bushings with a clean dry cloth at least once per year. If the transformer is in an outdoor substation where environmental contaminants can accumulate on hign voltage bushings possibly causing a flashover to ground, application of Silca-Gel on the insulator surfaces can prevent such occurrances;

3. Removing insulating liquid samples once per year and checking for acidity contamination and Hi-pot for dielectric strength—used to determine external contaminants creeping inside the transformer giving evidence of internal arcing or corona tracking which can ultimately fail;

4. Conducting periodic gas analysis by taking a gas sample from the top of the transformer in order to detect the presence of oxygen. Excessive oxygen is an indication that internal problems, such as arcing or an internal fault, have developed;

5. Checking high and low voltage winding insulation resistance to ground by employing 500 to 1000-volt megger once per year.

II. *Power and Distribution Transformers (Dry Type)*

1. Remove external covers and thoroughly clean and vacuum transformer winding;

2. Clean out air ducts between primary and secondary winding layers;

3. Wipe off support or stand-off insulators;

4. Check primary and secondary winding insulation resistance to ground by employing a 500-volt megger.

III. *Switchgear Equipment*

A. High voltage equipment (2.4 KV - 15 KV)

1. Switchgear bus and bus duct inspection

a. Remove metal covers: Inspect bus or bus duct for signs of overheating at joints.

b. Inspect bus barriers and supports to see if there has been chafing or wear against bus insulation.

c. Inspect feeder cable potheads and bus connections for corona tracking. Corona will only be evident on switchgear systems rated above 10 KV.

d. Inspect breaker compartment and bus duct space heaters to see if they work. When they do not in many cases it is simply caused by a blown fuse.

2. High voltage magneblast breakers

a. Remove breaker from cubicle and take off phase box barriers and inspect primary and main arcing contacts.

b. Check contact wipe and adjust to manufacturers specifications.

c. Thoroughly vacuum and clean dust and foreign matter from all parts of breaker.

d. Examine, clean and lubricate breaker closing and roller cam mechanism with appropriate grease, such as specified by the equipment manufacturer.

e. Clean and relubricate breaker high voltage bushing tips and sockets with appropriate contact lubricant.

f. Reinsert breaker in cubicle, place in test position and operate breaker several times to be sure it closes and trips properly. After closing breaker in the test position, at least one tripping check should be made by rotating the disc on one breaker circuit protective overcurrent relays to trip positions.

3. High voltage oil circuit breakers

a. Drop breaker oil pan and inspect primary contacts.

b. Check contact wipe and make appropriate adjustments if needed.

c. Remove oil sample from bottom of oil reservoir and test for acidity contamination and dielectric strength.

d. Check calibration of breaker overcurrent trip device once per year.

4. Oil fused cutouts

a. Remove oil sample from bottom of cutout and check for acidity contamination and dielectric strength.

b. Remove fuse holder and examine fuse link and check fuse clamping screws for tightness.

c. Examine oil fused cutout for oil leaking around top of the cover or oil syphoned from around cable leads. Oil leakage on a fused cutout is usually caused from overfilling. If this appears to be so, drain oil to proper oil level.

5. Circuit protective relays

a. Check calibration of circuit protective relays once per year using resistive loading technique. The resistive loading technique is necessary to assure good sinusoidal wave form, which will give accurate relay calibration. If high current lot voltage technique is used, excessive third hormonic distortion is injected into the relay and inaccuracies up to twenty percent can result.

b. Inject current into the CT secondary (5 amp circuit) in order to check integrity of the protective relay trip circuit.

B. Low voltage switchgear (480 volt and below)

1. Power circuit breakers

a. Inspect and service primary contacts.

b. Clean and relubricate operating mechanisms.

c. Clean and relubricate secondary contacts with contact lubricant.

d. If the breaker has series overcurrent trip devices they should be calibrated with a high current test set at least once every three years.

e. If the breaker has static solid state trip units, they should be checked with an appropriate test kit once per year.

IV. *Upgrading Electrical Equipment*

A. Synchronous motor control panels

1. Installation of new field application panels.

2. Installation of solid state power factor relays.

B. High voltage switchgear

1. Installation of battery alarm relays.

2. Installation of capacitor trip devices.

3. Installation of static under voltage devices.

4. Installation of ground pulsing systems for locating ground faults in high voltage systems shutting equipment down.

C. Low voltage switchgear

1. Installation of static ground fault system. This new electrical requirement is necessary to fulfill OSHA standards for 480-volt grounded neutral systems.

2. Replace obsolete breaker series overcurrent devices with time delay overcurrent protective relays.

V. *Expanding Existing Electrical Systems*

A. With continual increases in student enrollment at college complexes, in some instances it has necessitated expansion of existing electrical systems by gradually adding more equipment until the system becomes uncoordinated and no longer properly protected by the circuit protective relays and devices. In such cases it is necessary to perform new short circuit and coordination studies to insure proper protection of electrical equipment. Usually expanded electrical systems can be recoordinated by seeking outside assistance from a professional engineering or service organization.

VI. *Training Personnel*

A. Keeping maintenance personnel trained adequately to maintain on-campus electrical equipment is a real concern and a growing problem. It is especially difficult when the electrical systems involve solid state control systems. To fulfill this growing need, professional organizations offer training in several forms.

1. Seminars taught by experts actively engaged in field engineering.
2. Informal onsight training in which personnel are taught using the "hands on equipment" technique of preventive maintenance and troubleshooting work.
3. Professional engineering and service organizations have developed and now offer specific training courses, which include solid state theory and fundamentals and equipment troubleshooting techniques.

Summary

A. Since electrical maintenance costs are increasing, it is paramount that close attention be paid to efficiency and distribution of maintenance dollars.

B. Learn about electrical equipment in the plant. Determine its particular maintenance requirements and establish an electrical equipment program suitable to the electrical equipment needs.

C. Keep an accurate record of when and what kind of preventive maintenance is performed on equipment. Utilizing this approach will assure greatest benefit from the maintenance budget and may enable stretching the preventive maintenance program over a two or three-year period.

D. Reviewing qualifications of maintenance personnel and retraining or upgrading by consulting a local professional engineering or service organization in specific areas if necessary. They may already have a maintenance seminar or school which will meet personnel training needs. If not, they may offer a "hands on" troubleshooting and maintenance course tailored to specific equipment requirements.

Closing

When instituted, three fundamental actions will greatly diminish maintenance problems.

1. Know the equipment and determine its maintenance requirements.
2. Review maintenance budget and place proper priority on various equipment maintenance items.
3. If required, train maintenance personnel. People cannot be effective or efficient if they do not know proper maintenance methods and techniques.

Good preventative maintenance is the backbone of electrical equipment longevity and trouble-free operation.

SHOW 'N TELL—Following a luncheon for delegates and exhibitors, the latter were invited to table-hop and demonstrate and explain their newest products and services.

CAMPUS SECURITY

Results of a recent survey indicate education institutions

-Want a police department on campus

-Believe it should have police authority

-Expect outside assistance from local police, county or state authorities when called upon

-Think campus police should be armed

-Indicate they should be mobile—primarily by automobile

-Prefer formally trained officers with crime-free backgrounds

-Demand continuing training and increased efficiency

-Feel strongly that officers should be uniformed

-Think the police department through the chief should report to the president, the physical plant's supervisor (usually the vice president for business affairs) or the dean of men, women or students.

The most disturbing information the survey uncovered was the amount of crime on campuses today and the cost to colleges and universities in monetary loss. Response of dollar value loss over $71,000 was the trend over the last year. Insurance covered a substantial number of losses, but insurance costs are high and as losses rise, so do insurance premiums.

Increasing numbers of crimes against people are the most alarming statistic with assault most prevalent, followed by rape and robbery. Crimes against property show larceny the highest reported offense, followed by burglary and auto theft. Most reported offenses occur from 1600 to 2400 hours.

Many respondents reported having alarm systems, but most of these are limited to critical or sensitive areas and do not give general protection.

Traffic on most campuses is controlled by campus police who investigate most vehicular accidents.

Although the study of crime and its patterns yields no pat answers, over the years, crime has responded to two methods of enforcement—visual and nonvisual, outlined below.

Visual Enforcement

Survey response indicated most administrators desired uniformed officers travelling primarily by car or scooter, with vehicles marked to aid visual enforcement. Visual enforcement is based on the premise that visual evidence of police protection of an area prevents crime.

The theme of a recent lecture to police supervisory personnel was: "It is better to prevent crime than arrest for it." Needless to say, this brought adverse reaction from some—those who prefer to see criminals incarcerated. However, with the overcrowded courts and prisons crime prevention, rather than shoddy rehabilitation of offenders,would seem to be indicated. Most victims would probably agree also. Once a crime has been committed, however, it should be investigated and prosecuted to the fullest extent.

A personal example of visual enforcement is illustrated below: I received a phone call early one morning from a man I had arrested many years earlier for safe burglary. He asked if I remembered him, to which I replied I did. He said he was on parole and had gotten together with some old friends who wanted him to open a safe alledgedly containing money and narcotics. He did not want to go along with the group, but did not know how to say no! After some convincing, he agreed to tell me the location of the intended burglary. I told him to go along with the group and trust

---

By DAVID C. WALLBOM. *The author is director of plant operations at Bellevue Community College, Bellevue, Washington. He also served with the Seattle Police Department for 13 years in patrol, juvenile control, training and detective divisions. His first exposure to Bellevue was as an instructor in law enforcement, after which he became chairman of the law enforcement department. Based on his police and construction experience, he was appointed to his present position in 1968. He received his formal education from the University of Washington and Seattle University.*

me. When the suspects arrived at the drug store to be burglarized they found a marked police car with two uniformed officers sitting inside eating lunch. Needless to say, even the most naive criminal would not attempt a burglary with policemen sitting nearby. A subsequent traffic stop identified all in the group and caused them to disband, thus preventing a crime, learning identification of those involved and protecting a potential victim unaware of his near loss. The already overburdened courts were spared hearing evidence in this near crime, but most of all, a parolee got a chance to keep his life straight.

Evaluating visual enforcement is difficult because it is hard to measure the "amount" of crime prevented. How is visual enforcement measured? Some police departments graph exposure of their efforts in the community and percentage of crime drop—with very positive results.

In Mr. Paul Steuer's fine presentation on college campus security given at last year's APPA convention, he stated, "Law enforcement is much more than just making an arrest."

Ancillary benefits occur from exposure of officers within the community:

-Providing and receiving information readily

-Obtaining directions easily

-Giving aid spontaneously when required

-Suppressing drug use.

Neat, well-groomed professional officers can do much to improve the image of the college and prevent crime.

Nonvisual Enforcement

Nonvisual enforcement is investigation and apprehension of suspected offenders. No matter how effective preventing crime via visual enforcement is, some will nonetheless occur. Officers must fully investigate offenses with disposition of cases handled in student hearings or submitted to the courts for criminal prosecution. Uninvestigated or unprosecuted crimes breed more crime.

Nonvisual enforcement requires adequate training of officers, especially on college campuses where this activity could be mistaken for spying or invasion of privacy. New police officers are trained to investigate traffic accidents which often attract a group of onlookers—some who have seen the accident and others who have not. It is the officer's responsibility to obtain information. Conversely, it is his responsibility to keep the area clear of pedestrians so an investigation can be made and the injured cared for. Officers are instructed to approach the crowd to obtain each person's name and address. When done overtly, the evacuation of the crowd is immediate, since people do not always want to get involved. Interviewing techniques require the officers to know what questions can be asked legally, and what warnings must be admonished, as well as how to handle questions to obtain the most information. He must watch for tell-tale signs given by the person being interviewed:

-Eye contact

-How often the person swallows

-Rate of respiration

-Perspiration on hands and face

-Nervousness

-Lack of organization of responses

-Unwillingness to respond

-Overwillingness to respond.

These comments on visual and nonvisual enforcement support the need for a uniformed police force, as long as it is augmented by a nonuniform or investigative group, which does criminal investigation consistant with statutory law and institutional policy.

A major service campus police provide is controlling campus traffic and parking. Most know the value of traffic control at athletic events, as well as the tremendous parking problems associated with such events. A good campus police department should also effectively investigate vehicular accidents occurring on campus. This is a job requiring special training and execution. At least thirteen points should be covered in a well-managed accident investigation. Most campus police departments have this responsibility and authority.

Should campus police be armed? The survey indicated arming campus police is commonplace. As long as society continues as it has, it is ludicrous to do otherwise. Of course, fear of shooting in error, or making other mistakes associated with carrying firearms, is a paramount consideration. Good training and enforcement of strict rules of firearms' use usually controls their *misuse*. Psychological entrance examinations also tend to eliminate individuals prone to misusing firearms.

The manner in which firearms are carried also affects their reception by the college community. The big chrome-plated, pearl-handled, low-holstered weapon is generally offensive to the public and does not meet current police standards.

Policy authority for campus police appears normal. Such authority has many advantages, as it usually imposes state standards in recruitment and background of new employees, while maintaining an ongoing in-service training program. Such training generally leads to eligibility for high calibre federal law enforcement programs. Such authority also attracts good candidates, who look to the college or university for long-term professional employment.

To the college or university administration, campus police provide campus autonomy from the community without having to rely on municipal, county or state law enforcement.

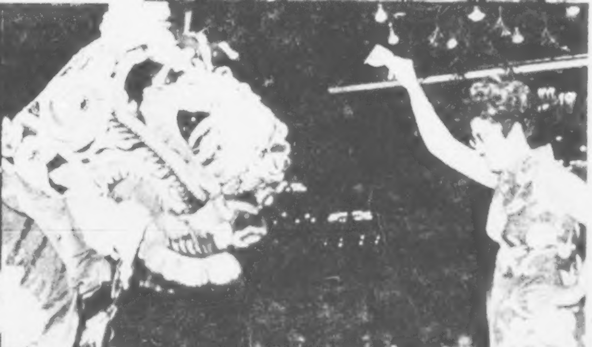
Generally, security forces do not meet these standards, but because of budgetary limitations, they are used anyway. Used most effectively, security personnel should be limited to building security with no enforcement responsibilities. There are, however, many fine college security departments despite limitations.

When campus disturbances occur and outside authority is needed, campus police usually have better rapport with opposing factions and cooperate with local police rather than surrendering their authority to them entirely.

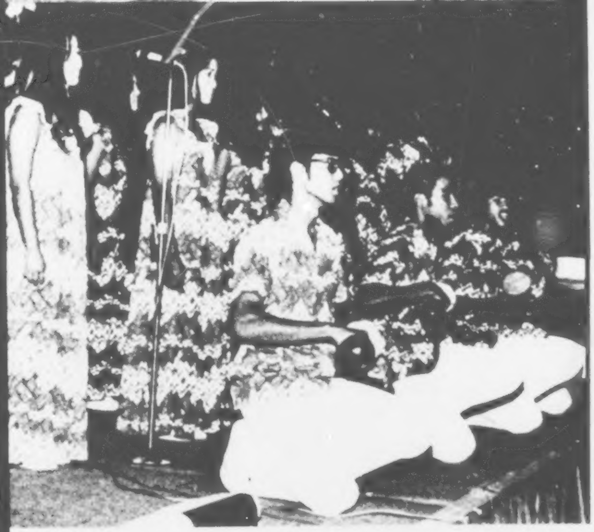
Use of alarms on college campuses appears to be on the upswing. The cost of many systems prevents their general use, but new, less expensive systems with wide capabilities are a future possibility. Alarms run hand-in-hand with visual enforcement, doing more to prevent crime than to apprehend offenders. A store owner was plagued by burglaries. He installed an alarm system utilizing tape on the windows, and burglaries dropped to near zero. He later sold the store as his business had outgrown the space, and the new owner kept the window tape, but did not employ the commercial company which had previously monitored the alarm system. Amazingly the new owner suffered no losses for over three years.

The advantages of having a police department within the physical plant family are obvious. This arrangement increases visual enforcement and allows maintenance, grounds and custodial personal the chance to be more aware of campus crime, thus encouraging them to work together as a unit. This combined interest could be more effective given good direction by physical plant administration.

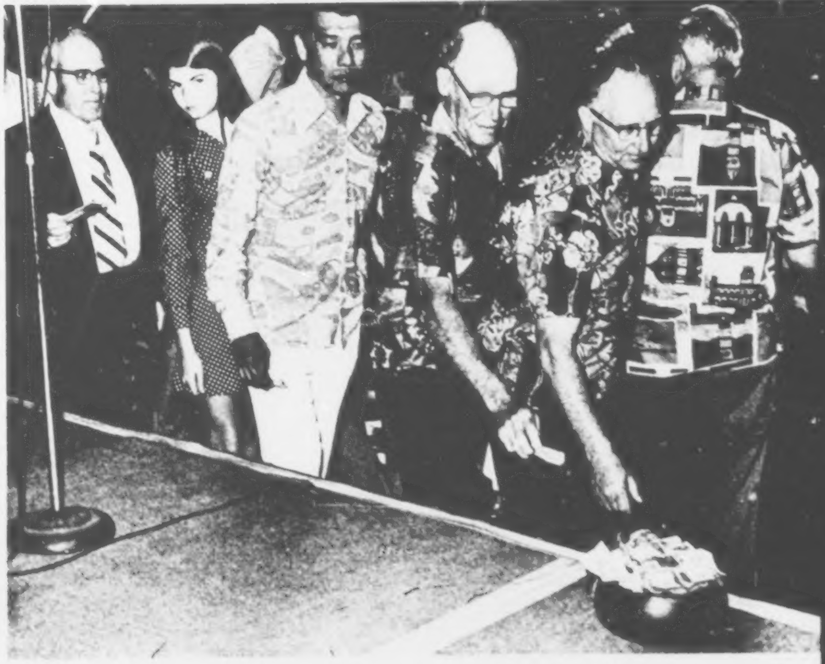
ANNUAL BANQUET—Climax of APPA's 60th Annual Convention was the traditional annual banquet, which was far from traditional in cuisine and entertainment. A seven-course Chinese dinner featured: Egg Flower Soup, Lemon Chicken, Stuffed Duck, Crab Roll, Shrimp and Pineapple, Sweet Sour Pork Peking Style, and Kau Yuk With Bun. Entertainment was provided by the Aiea Swinging Singers of Aiea High School. Invocation was by The Rev. David K. Kaupu of Kamehameha Schools, who also performed this function at the Opening Session. The festivities were opened by the Lion Dances, illustrated in the photos. Good luck for a year is promised in return for a gift of money placed in the lion's mouth.



AIEA SWINGING SINGERS—The Samoan songs and dances of these talented high school entertainers promoted many APPA conventioners to make contributions to the group's forthcoming tour of the Orient. In return, the singers performed numerous encores.



PRIZES GALORE—The teenager closest in height to the length of a surfboard received that surfboard as a prize. Other prizes went to the youngest attendees at the convention.



EGIST
GER WHOS
GHT
THE

MORE AWARDS, GIFTS—At right, B. P. McKay, director of physical plant, University of Tennessee/Memphis accepts third place award in the Technical Paper Contest from Phil Wong, assistant convention chairman. Below, President Simon receives Key to the University of Hawaii from Wytze Gorter, Manoa campus Chancellor. Chancellor Gorter delivered the Opening Session welcoming address. At right center, Chairman Phil Koehler presents Executive Director Paul Knapp with travel alarm clock "to make sure he gets up on time while traveling on APPA business." Bottom left, Mary Jane Simon, affable wife of President Simon, receives muu muu from Phil Wong. Clyde Hill, immediate past-president, presents plaque of appreciation to outgoing President Simon.

AND MORE PRESENTATIONS—At top left, Clay Carpenter of University of Nevada is presented his APPA membership certificate as APPA'S 1000th member from Walter Wade, vice-president for membership. Carpenter also received the monkey pod bowl. At top right, President Simon receives piece of luggage from Phil Koehler. At left Phil Koehler is given a wristwatch, "a token of appreciation for his outstanding performance as chairman of the convention," from APPA by way of President Simon.

AND FINALLY—The gift that George C. Moore of the University of Cincinnati was waiting for all evening, the gavel, symbolizing the transference of the office of president from Ted Simon.

TECHNICAL PAPER CONTEST

In conjunction with the Hawaii Convention, Technical Papers on subjects relevant to physical plant administration were judged by a committee which rated them as follows:

1. "Integration of Modern Methods for Plant Maintenance"
   By Howard D. Wilson, Associate Director Physical Plant
   Michigan State University

2. "Formula Approach to Plant Maintenance Budgeting in Ontario University"
   By C. William Morgan
   University of Windsor, Ontario, Canada

3. "Diagnosing Physical Plant Operation"
   By Billy P. McKay, Director Physical Plant
   University of Tennessee/Memphis

4. "Pitch for Productivity"
   By George C. Moore, Director Physical Plant
   University of Cincinnati

5. "Improving Materials and Supplies Flow in the Building Service Function"
   By Floyd G. Miller, Assistant to the Director Physical Plant
   University of Illinois/Chicago

ECONOMIC JUSTIFICATION FOR OFFICE LANDSCAPING

Open office planning or a form of it accounts for approximately 15% of new office installations or major office renovations. An open office plan is an environment not adhering to rigid, formal rectilinear, cubicle, private office space layout patterns and organization commonly used. It encompasses such concepts as office landscaping, freeform layout, modular planning and similar office systems. Early forecasts made in the late 1960's indicated open office planning would account for only 10% of the office furniture market by 1974.

To better understand why open office planning has made this incursion into American business and is continuing to grow in its acceptance and appeal, examine benefits it purports to give users.

Open office planning provides maximum flexibility in utilizing available office space. Since it advocates elimination of most private offices, floor-to-ceiling partitions, drywalls and other confining obstacles freeing available floor space, the ability to add new employees to areas and departments where required becomes a relatively easy and inexpensive undertaking. Departments and sections of departments can be kept together. Most furniture and equipment in an open office plan is freestanding and can be moved and rearranged quickly (in hours or in a weekend at most) without the inconvenience of dust, dirt and paint fumes over several days or weeks, generally associated with "conventional" office changes.

More function-oriented equipment is used resulting in improved efficiency, productivity and better morale. For years the double pedestal desk and four-drawer filing cabinet have dominated the office. As technology has improved, traditional forms of office equipment and their variations have not enabled office employees to satisfactorily perform their duties and effectively handle the new forms, documents and paper with which they are now required to work. This is believed to be a root of the "I don't care" attitude of office employees today. They do not have the proper equipment to deal effectively with their work. Dissatisfaction, absenteeism and high turnover result. Subsequently, the cost of managing and running the office increases. Coupled with today's profit squeeze, this additional cost cannot and should not be tolerated.

Open plan systems equipment can be "tailormade" to the requirements of the type of work, paper and equipment used. Vertical space not usable with traditional equipment can be utilized to the worker's benefit. When an employee has the tools and equipment he can perform his tasks and get personal satisfaction from his work. His morale improves, absenteeism decreases, as does turnover rate. Naturally, office costs are reduced by resultant contributions to profits.

The office environment is a more pleasant, comfortable place in which to work. A firm enjoys a clear edge in attracting and keeping employees when if offers attractive offices. Open office plans generally utilize carpeting, acoustical ceilings and comfortable, pleasing color schemes making work areas attractive. Also, a well-planned open office system protects the status and prestige of executives insuring their high morale. Maintenance costs of open planned offices are reduced compared to upkeep of "conventional" vinyl tile-type offices.

An office or building designed for an open planned system costs less. With removal of private offices, enclosed partition spaces and dry walls, expensive basic cost factors are dramatically reduced. For instance, duct-work and controls for office climate systems are reduced in size, amount and complexity resulting in lower design and construction costs. Electrical systems are less complex and less expensive to install. Lighting problems are simplified and operation less costly. Basic building costs have been reduced by as much as 19 to 24% when designed for open office plan interiors versus "conventional" office usage.

Open office plans resulted directly from the introduction and promotion in North America of "Office Landscaping" (Burolandschaft) by the Quickbourner Team, a German management consulting firm in the Hamburg suburb of Quick-

---

By A. LITCHARD DICKINSON. *The author is merchandising manager of the Inter Royal Corporation, One Park Avenue, New York City 10016.*

bourn, West Germany. Their ideas were interrelated and were designed to be used together and in full. These ideas compose a "system." Briefly, they are:

1. Planning begins with detailed analysis of actual patterns of communication in the office—written, spoken or telephoned. This communications analysis replaces organizational charts, departmental structures or more conventional criteria and becomes the basis of the landscape process.
2. Planning is largely a matter of making as short and effective as possible lines of communication used most often, so that people who work together are in close proximity regardless of rank or departmental status.
3. There are no partitioned private offices, even for top executives. Light moveable screens control lines of vision and establish personal and group work areas; other systems, however, offer use of private offices and conference rooms.
4. Geometric layout is avoided to make adaptation to the operations-based plan easier, promote flexibility and avoid a grimly regimented appearance.
5. To cope with acoustical problems, carpeting is used throughout, ceilings are equipped with an acoustical baffle system and sound reflecting surfaces are avoided, as is furniture with large vertical reflective surfaces.
6. Work spaces contain only material in active use. Files are removed to centralized locations. Generous lounges are provided for staff.
7. Architecturally, the ideal landscaped interiors is well-planned. Windows are needed only to avoid total isolation from the outside world; general lighting and heating/cooling of the entire space must be excellent.

In developing and instituting these ideas, strong emphasis is placed on communication, particularly between managers and middle managers. Unobserved methods of information processing become visible and tend to create a management structure based on function rather than on the company's organizational structure. This often forces realignment of the method of management in a company or business. It is the changing of a firm's method of management more than any other factor that has inhibited acceptance of the system in North America. However, some of the basic ideas of the Quickbourner Team's system are sound and set the stage for the open office plan.

Obtaining the benefits and reduced office operation costs of open office planning while retaining the basic organizational and management structure of the business seems formidable. While some attention is paid to paperwork flow in planning and adoption of open office planning, the main emphasis is on communication among employees. Perhaps too much attention is focused on this aspect of office management and efficiency and not enough to true common denominators of office work and efficiency in American business.

The purpose of an office is to control and keep account of the transactions of a business or service operation. This control and accounting is accomplished through use of records and similar data. This data is recorded, reported and processed in the office with *paper* the major medium. Paper handling, record management and decisionmaking are what an office is about.

In the processing of paper, after one cuts through all the forms, printouts, letters, memos and reports, the basic paper that controls office operation is an *order.* Everything in a business revolves around it and its normal flow through an organization. It is the element that puts everything in motion.

An order may take the form of an approved and accepted bid, an accepted insurance policy application, a letter from a client requesting a service, a telegram requesting a special part or tool, a purchase order from another firm or a decision by the board of directors. It comes in many sizes and shapes, but it is the key piece of paper in American business.

Offices process orders and other paper necessary to complete the order. In simplified form, there are six basic steps in processing an order:

1. Work, planning and policies necessary to get the order;
2. Methods of receiving the order;
3. Work involved in accepting and entering the order on the books;
4. Work and office processes in "manufacturing" the products or service required on the order;
5. Functions involved in shipping the order;
6. Invoicing and collecting money for goods or services performed.

This six-step basic process is called the Orderflow.™ From each step of Orderflow all paper, forms, reports and office work are generated. Looking at each step in more detail reveals this clearly.

Getting the Order: This step of the Orderflow encompasses such departments and work as planning, sales forecasting, advertising, marketing, sales reports, credit and bidding. It involves interrelated work from sales forecasting to manufacturing and credit to financing, etc.

Receiving Order: This involves mailroom operation, computer terminals, TWX and Telex machines, telephones and telegraph operations—in effect, the proper means of receiving and controlling orders as they come into the organization.

Accepting Order and Entering It On the Books: Such office operations as rewiring, typing, coding, bookkeeping machine and computer operations are involved in this aspect of Orderflow.

Manufacturing Order: Production control operations, material control, production orders, engineering drawings and routings, purchasing, inprocess controls, raw material inventory, finished goods inventory, accounts payable, scheduling of personnel, research teams, report writing, project control, typing forms, departmental meeting and customer contact are all part of the "manufacturing" Orderflow.

Shipping Order: Warehousing, bills of lading, freight bills, traffic controls, damages and claims, return goods control, presentation of reports and plans, dissemination of information, and mailing material enter into shipping the order.

Invoicing Order: Invoice to customer or client, accounts receivable, financing, credit, treasury and cash controls are part of this portion of Orderflow.

When office operation is studied in this context, work falls into a reasonable pattern. It provides a strong guideline from which an office can be analyzed. It illustrates that *all* machines and equipment, even computers, are simply tools to facilitate processing and control of the *order.*

This is not to propose that communication in an office is not important. People come and go and each new face in a department or a section of a department changes the art and science of communication. When a new worker enters a six-person department the communication in the department changes, since a new personality has been introduced to the scene. Communication efficiency in this section will rely on the talent of the supervisor and the adaptability of other workers in the section. The work each person performs in the Orderflow remains constant. Each processing step has to be accomplished by a person or by a machine controlled by a person. *People process Orderflow! People communicate to insure efficient Orderflow!*

Thus, by turning attention to the common denominator of office operation, Orderflow, it is possible to secure *all* the benefits of open office planning without having to change the method of management, organizational chart and accustomed manner of doing business.

The emphasis is directed to implementing Orderflow with equipment, furniture and environment which will bring the economic benefits of the open office plan. Space Georgraphy is an office furniture systems concept designed to do that.

Space Geography, a concept conceived by InterRoyal Corporation, involves harmonious blending of freestanding panels with furniture and equipment attached to them (called Openscape), combinations of desks, lateral filing and storage equipment (called Coordinates) with "conventional" desks and files into functional, effective and productive office operation in a unified design theme. Three systems become one.

Space Geography is based on the belief that no one furniture system properly and effectively serves all the varied functions and operations in the American business office. Furthermore, if a particular work station requires filing and storage space for 300 inches of material, the worker should have this storage capacity conveniently available for instant reference or use. If in 2 years he needs 350 filing inches of material, Space Geography can easily accommodate it. Orderflow demands that certain jobs handle its paper, machines and devices in a specific manner. To limit these basic operations because of lack of scope and flexibility in furniture and equipment is self-defeating.

Space Geography offers the advantages of freeform, responsive-to-department needs and space layout requirements. It offers nonspecial equipment which handles *all* types of "paper"—from microfilm reels and MT/ST cartridges to 11 x 14 7/8" computer printouts. Organizations and workers do not have to change their mode of operation to secure the advantages of open office planning. Indeed, with Space Geography it is possible to gradually change offices from conventional equipment to an integrated, coordinated open office plan. Sections and departments can be changed independently of one another so benefits of open office planning are realized as implementation of the entire change to the system is made. Budgets are protected; the investment helps pay for itself as it is installed.

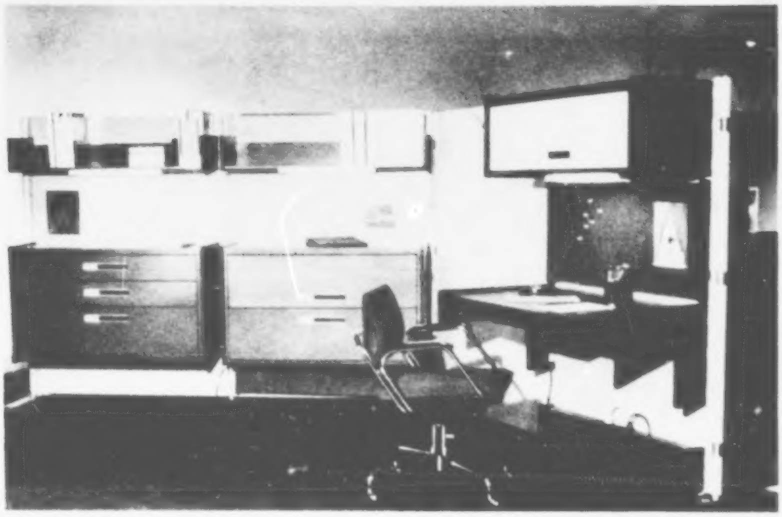
One of the most controversial aspects of open office planning is the "sense" of lack of privacy.

Space Geography-equipped offices offer opportunities for attaining optimum results in all aspects of office comfort, visual pleasure, work flow, ease of communication, access to records and staff and acoustical privacy.

Rarely is speech privacy required in offices of any type, whether partitioned or open. Occasional exceptions are conference rooms and offices used for discussing confidential information, hiring or firing, or functions where raised voice levels may be used. In the main, most offices require two degrees of acoustical separation (Noise Reduction)

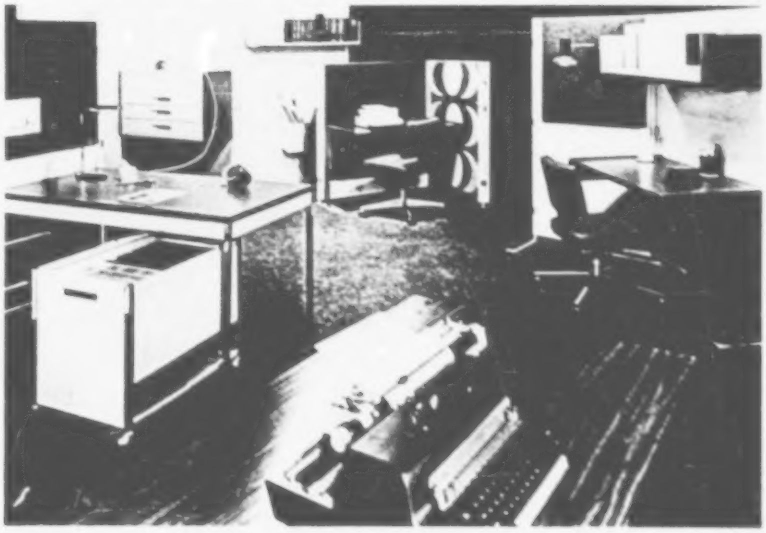
A. *Freedom from speech intrusion:* i.e., the ability to perform routine and creative tasks (reportwriting, addition, dictation, etc.) without distraction from another worker's conversation.

B. *Speech privacy at low or normal voice levels,* the inability to distinguish what is being said; in effect, speech becomes noise and part of the overall background or "masking" office noise level.



(Left) Open office planning provides maximum flexibility in utilizing space. Most furniture and equipment is freestanding and can be moved and rearranged quickly without dust, dirt and paint fumes usually associated with conventional office changes.

(Right) With removal of private offices, enclosed partition spaces and dry walls, expensive cost factors are reduced. Duct work and climate control systems are less complex, as is the electrical system. Lighting is simpler and less costly to operate.



Space Geography-equipped offices offer opportunities for attaining optimum results in all aspects of office comfort, visual pleasure, work flow, ease of communication, access to records and staff and acoustical privacy.

It was discovered that Noise Isolation Class (NIC) as per ASTM E336, "Recommended Practice for Measurement of Airborne Sound in Buildings," more accurately and responsively measures acoustical separation (noise reduction) in the open office plan.

In the open office plan environment, sound travels spherically in all directions without encountering walls and other reflecting surfaces, and sound intensity decreases as the distance from the source increases. It follows, therefore, that the greater the distance between the speaker and the nearest listener, the less is heard. However, since space is limited, 110 to 140 square feet per occupant is a reasonable compromise between space usage and noise reduction (see Table 1).

TABLE 1

Square Feet/Occupant Including Aisles, etc.	*Average Distance Between Occupants*
110 Square feet	8 feet
120 Square feet	10 feet
130 Square feet	12 feet
140 Square feet	14 feet

This range, however, will not be adequate acoustically unless a barrier is imposed between the speaker and unintended listener, placing the listener in a "shadow zone" of the speaker's voice. This barrier, part of Space Geography design, is essential to acoustical separation in open office planning.

An additional component of acoustical separation is the position of the speaker's face in relation to the nearest unintended listeners. Obviously, the maximum speech signal is achieved with the speaker facing the listener. Therefore, it is wise to avoid direct head-on placement of workers in the open plan office and, if possible, to have the side or rear of the speaker toward the unintended listener. This is achieved by proper furniture design, location and positioning.

Space Geography incorporates a series of Sound Control Office Layout Principles. Based on extensive testing by Michael J. Kodaras, Inc., acoustical consultant (full test reprint available upon request), these principles are:

1. Use 64" and 82" high panels with less than 3/4" space between panel bottom and floor;
2. Use carpet-like fabric on panels;
3. Use "Y" configuration whenever possible;
4. Position furniture and equipment so that workers are at least at 90-degree angles to one another;
5. Average 125 squ. ft. per occupant – 10 to 12 feet between people;
6. Maintain background noise level at 50 dBA.

Every office has several areas which require special attention and handling in open office plan structure and layout. Computer rooms, terminals, order entry machines, TWX or Telex machines, copying machines, printing equipment, or mailing operations, complicate optimum Orderflow and open plan layout. These are called *special function areas.*

A computer, although just a tool to facilitate Orderflow, requires its own environment and because of its cost and nature, cannot be conveniently spread around to different areas of a building. Care must be taken to insure free flow of information into the computer room and free flow of printouts from it. Traffic patterns should be analyzed and layouts modified to accommodate this high activity area. Storage and control of supplies for the computer room should be given special attention.

The same care should be taken with other special function areas. Each creates its own special problem to be considered and solved. Copy machines are noisy. They should be located properly and serviced to reduce annoyance factors to personnel in the immediate vicinity. By good preplanning all other special function areas can be handled economically without sacrificing the basic open plan theme and benefits.

Open office plans are economically valid and do provide the benefits attributed to them. Investigating the feasibility of using open office planning is prudent if moving or renovating present offices.

EXPERIENCE EXCHANGE-LARGE INSTITUTIONS

Panel: There seems to be great interest in energy conservation and how to achieve it. Would you address that subject?

Speaker: Institutions are tremendously concerned about the direction of energy conservation in terms of consumption and demand. Large schools like Cornell have high energy users, such as syncratrons used in research. Shutting down capacitors at night helps conserve energy, but where does a conservation program go from there? Groups on campus are interested in establishing an energy policy—a difficult task for a university. There is no national energy policy, which complicates the task, and without such guidelines it is difficult to provide a very complete picture of the subject.

Speaker: About central control systems, at our university such a system will be available in the near future. It will monitor demand on the utility companies' board at the metering point, enabling users to selectively keep demand down. Some pumping facilities also fall into that category.

Speaker: The University of Southern California is facing very difficult times with regard to energy conservation. It seems that the basic philosophy of the administration is to increase utilization of facilities. They are encouraging weekend and night programs. The school already has a very active nighttime program enrolling in excess of 11,000 students. The administration is encouraging increased usage of space and, of course, that conflicts seriously with any type of energy conservation program. There is no official closing time at the University, and that makes it difficult to maintain control over energy usage.

How many institutions represented here today have an official closing time—a time when the door is locked and some form of permission must be obtained to use a building after hours?

Howard Walters, Ohio State University: Ohio State has also been troubled over the "open" concept. The new president wants the buildings open, and certain ones are designated "open" and certain ones closed, i.e., closed on weekends and at certain times at night. As yet, with the three or four new people required to monitor this schedule, doors are still left open and this is causing problems. The problems may never be solved, but at least there is something on paper which says the building will close at 5 p.m. or 10 p.m. and on Saturday or Sunday.

Another thing the physical plant is doing is making foot candle readings in each building and inducing building representatives to reduce the wattage of light bulbs being used—to take out some of the tubes in order to reduce use of electric energy. It sounds feasible, but there are difficulties. Why can't 720 tubes be turned out when there are only two secretaries in the room? This theory is apparently sound except that when the lights are off, the switch makes too much noise.

Carrying through a conservation program will be interesting, and in the end there will be many more headaches to contend with than just a noisy switch. Making a conscientious survey is challenging. Devices such as timers can be used to turn off power to large areas no longer used. There are areas not used during vacations and yet custodians, out of habit, will continue to turn the lights in these areas on and off. A newly instituted policy is asking building users to adjust lights they will be using when they enter and leave. However, an example of defiance comes from one Ph.D. who says he uses the building to teach in only!

A 10-foot hall, 300-feet long has 200 foot candles of light. The people who designed this made money—removing every other unit of a 4-tube unit running the entire length of the hall saves almost a third in energy. This is not a chore, but a challenge! At Ohio State the budget is going to be cut by 8% in electricity, oil, gas, etc., and it will be fascinating to see how many places can be cut down 3 or 4 degrees to save.

Question: I don't know how many others have been approached, but a few months ago our electrical suppliers visited the campus and were anxious to help us develop a conservation program. How many have had that experience with their utility companies?

Answer: Southern California Edison is working on it.

Speaker: In the 19 California state universities considerable problems have arisen with electrical utilities budgets and with utilities whose supply runs consistently behind, while demand increases. Automatically every October and April—the middle of the semesters—demand climbs to a new plateau and never goes lower again.

L. Council, Texas A&M: Texas A&M had a brownout this winter and turned the lights off on the campus, darkening hallways and entrance lights. An effort was made to adjust classroom lights to a usable level, rather than to a designed level. An effort was also made to change the air-conditioning/heating system slightly. One useful suggestion for instituting an austerity program is getting the school's administration behind the effort. When faced with a campus shutdown because of lack of fuel, the academic department said that without lights they would rather stay home. Start implementing changes from the top, so that the plan will reach down through the administration to a practical application level.

There is much to be gained by an environmental control system monitoring utilities to buildings from a central point. With centralized control it is possible to change the environment when classes are not in session, rather than to let the buildings waste energy when unoccupied.

B. Folts, SUNY/Buffalo: About closing buildings, SUNY/Buffalo faced this problem about two years ago and still has a serious problem, but a solution surfaced which has partially helped. A plastic card on the main entrance to each building phrases positively the building hours: Open 8 a.m. to 10 p.m., or whatever. Of course, with over 150 buildings each one is different. However, it does inform the security force of closing times—the time when occupants can be asked to leave and when the building can be cleaned. It is not a solution but it does provide partial assistance in achieving an understanding with faculty about when the buildings could normally be expected to be used.

On the energy crisis: SUNY/Buffalo is in the midst of building a 6.5 million square foot total electric campus, and it will take ingenuity to control demand and load. The campus will have environmental control systems which will include load shedding and overall control between buildings. However, this is not the total answer. In the meantime, as the buildings are constructed there is the problem of trying to control individual load, and living where electric snowmelters and other special equipment is required, adds to the problem. With the first building demand was the biggest problem to be faced. With the help of a lot of people pulling the right switches at the right time the bill was brought down about $5500 the first month just by scheduling demand. There is serious consideration being given to demand meters and controls that can be used immediately to get on line prior to the time the system (which is computer-controlled) is really working. Any suggestions or ideas on the subject of demand control are invited.

Question: Is the air-conditioning system electric?

Answer: Yes.

Question: Have you considered demand storage?

Answer: There is some storage capacity built into the system, however, the building program will run through 1978-80, and all the details of the total system are not available. One problem is that the design of the system, which apparently makes use of all the known storage tricks, is handled by a state construction fund which doesn't allow input from potential users.

Speaker: We have been talking about this also. I don't know how much storage would be required to take the bigger chillers off the line in the middle of the day, but we are starting to get into this. Since we don't have chilled water loops yet, we have no way of accomplishing this. However, the physical plant is trying to see how to set the plant so that some big machinery can be turned off during the rest of the peak demand period.

Speaker: At the University of Southern California engineering and architecture are being watched closely to assure more diversification in design. For example, smaller chillers are taking over the work of larger ones at certain times of the afternoon, certain times of the year, and at night.

Question: At Cornell researchers have been talked into shutting down all 100% fresh air systems during the winter, but can people in warmer climates also benefit costwise from such a procedure during the summer, or is the heat buildup too great.

A representative from Carrier Air Conditioning Company: One of the members of the panel said they used two smaller units to save electric input and at first this appears to make sense. But Carrier or any other reputable manufacturer has load control devices which assure that as load decreases, the power falls off. This is standard equipment on the machine and should not cost extra. Also, there is a demand limit control on the machine. It is incumbent on the user to be cognizant of energy sources, as there is pressure on them to utilize energy efficiently; that pressure is also felt by the manufacturer. The "big three" in campus air-conditioning are all looking at the same thing. A fresh air system in the summer is very expensive and depending on the type of building, 100% outside air is not needed. Air that has been chilled once already is relatively clean and doesn't heat up much after first use and can be used again. Using the money saved and putting it into better filters allows use of more return air. One of the biggest users of 100% fresh air systems at Cornell is the chemistry research building in which there are 20 air changes of 100% fresh air per hour. The savings in shutting down that system at night are fantastic.

Speaker: In order to keep from bothering with humidity control an ordinance plant in Texas uses a dehumidifying system with a regenerating system that takes moisture out of the air and refrigerates it to the temperature required. It is immaterial to this type dryer whether it is refrigerated, and it is a relatively inexpensive way to take the moisture out if the moisture is taken out before it goes through the refrigeration circuit a considerable savings can result. A lithium chloride system uses a contact column, and its self-regenerating blows moisture out one side and fresh air enters on the other side. The process is continuous and is fairly economical to use powerwise.

Speaker: Does anyone have any ideas about how long it will be feasible economically to use double duct systems in which one duct warms air to 100 degrees and the other chills it to 55 degrees before they are mixed?

Speaker: Energy conservation seems to focus on two things—cooperation from faculty and staff, and design. Staff generally cooperate well; faculty less so. Building design can determine using or conserving energy in the future. High pressure double duct systems are a facet of this concept. Another is entertaining the idea of changing design requirements regarding use of windows. In the past architects have advised minimizing window use, and we are beginning to look at this as a possible conservation measure. Classroom utilization is another factor. The school has in the past favored small classrooms. Building larger ones which hold more students is a less costly use of space and utilities. We are continually trying to find new ways to instruct architects and engineers to design buildings to meet future energy crises.

L.T. Suber, Colorado State University: At Colorado State records are kept on each building and an inventory can be run quickly on cost of energy to run each machinery room. Surprisingly, costs vary: $10 to $15, and a few larger rooms, $18 per hour of operation. The statistics of converting electrical loads to cost per hour convinced the administration that budgets can be met by cutting off operation one hour per week—52 hours per year. This can be accomplished with time clocks, particularly on weekends. It was found that even faculty supported such actions when results were documented, and their concern has helped the success of this project.

For those schools not having automated systems, Colorado State suggests using something like its building profile system. It takes very little time to compile such things as inside and outside building temperature, and based on that automated equipment, if it is available, can be used to shut fan rooms on and off, or a skilled operator can within 15 to 20 minutes bring the building up to the desired temperature when it opens in the morning and cut it back in the evening. That is a selling point for those going to complete automation—$50,000 to $100,000 in savings on energy alone can be realized on a large campus per year. Although each building is a little different, the profile system work for heating and cooling.

Much has been said on the energy crisis and it will undoubtedly occupy more time in the future, and it is probably not being facetious to say that solar energy should be considered as an alternative.

L. O'Neil, St. Louis Junior College District: The St. Louis Junior College District has about 20,000 students and about a million and a half square feet of air-conditioned space. The buildings are reasonably new, ranging in age from five to eight years old. All the problems and solutions mentioned today are integrated, but no one has talked about dollar conservation. Energy conservation is great, but with budgets what is discussed is dollar conservation as well.

About lighting: One discovery made was that clean, four-tube light fixtures produce 100 foot-candles light—about the same as a dirty eight-tube light. Some areas in the district are served by radiant heating cables and other places that require air-conditioning in cooler times of the year, by a "cooling car." It was discovered that these special features ran all year long—$500-700 per month wasted at one college.

About air-conditioning load: Cutting down lighting and heat load enables cutting down on air-conditioning, too. That factor, plus using less fresh air, conserves energy. This also gets back to design of the system; the architect and consulting engineer is blamed for faults in the system, but they are rarely given criteria to work with. Sometimes the original design is faulty—the duct work may have to be changed or at least the damper arrangements, or by-passing incorporated to recirculate the air. Twenty-five per cent savings are feasible with effort from the physical plant. Situations such as: One campus for some reason uses $7,000 a month in gas in the summer. The other colleges which are almost the same size use $4,000 worth a month. Why should one be $3,000-4,000 more a month? Before talking to administrators and faculty about the situation what is required is cost identification. This applies also to extracurricular service to the community. Two cost identifications were made about air-conditioning: Services to the community, such as air-conditioning stage area for the little theatre group doesn't cost $5 per square foot, or so much per hour—it costs much more than that, and such users should be informed of those costs; and night custodians wanted the air-conditioning left on, causing the entire campus to be air-conditioned 24 hours a day.

Question: To those people beginning to experience brownouts: Are you finding yourselves under greatly increased pressure to provide emergency power at each building, and if so, how are you going to accomplish this?

Speaker: There is a program for building emergency generating facilities, particularly in universities having hospitals connected with them in which patient care is vital. UCLA is in the process of providing emergency units for the hospital, a contract for which has just been let. Many UCLA buildings also have emergency generators to take care of exit lights and that sort of thing, as do most other schools, but the situation requires more study and attention because it is evident that energy will continue to be scarce, and there will be serious trouble unless other means of generating energy are made available.

Commenting on things mentioned previously, someone said not to bother researchers with energy problems as they are hard to convince. That may be true, but there are things that can be done. Generally, research is funded from external sources such as grants and contracts. At UCLA not much attention was paid to the cost of energy for research products because electricity on the west coast has been quite reasonable until lately. The school is now establishing a policy whereby any research grant or contract must tell clearly and definitely the energy requirements for that contract. It is made clear to researchers that energy costs must be charged against the contract or grant. Furthermore, if that energy requirement adversely affects the demand factor for the entire campus, further adjustment in the electrical cost is figured. In other words, if the researcher cannot schedule the operation of his experiments—particularly if they have high electrical energy demand requirements—such that they do not interfere with the demand capacity for the campus, he will be responsible for offsetting the electrical cost increase for the entire campus. That provision is now made part of the negotiations for contracts and grants, at least for new research products.

Other things cause problems. Shutting equipment down at night and on weekends, in particular, is economical, but there is always one professor whose experiment has to operate in an air-conditioned space, and he requests 24-hour air-conditioning for the building in which he will be working. That goes back to a policy that must be established for every institution: the determination of when certain facilities will be required to operate—a determination that can only come through top campus administrators. This determination can and must be made.

Another thing mentioned today is designing for energy conservation. This is a relatively recent development and many designers have not been very concerned about it in the past. Now is the time to design new facilities with energy conservation in mind. No one single policy will apply to all institutions. In the Los Angeles area, outside nighttime temperature can be used to maintain the interior environmental control of buildings, if such a system is designed properly for the building. Unfortunately, in most air-conditioned buildings there is no system designed to use outside night air, and therefore the interior builds up heat if air-conditioning equipment is turned off completely. If designed properly, in the Los Angeles area, natural nighttime temperatures could control interior building temperature and save on utility budgets for that purpose, but design consideration is required to accomplish this.

Speaker: Going back to the comment Terry Suber made regarding involving the administration and faculty in decisions relating to energy saving: They may not be keenly interested in energy savings per se, but they certainly are concerned about saving money. USC established a task force on resource management which, in effect, serves as an auditor for all new programs presented within the university, or all major changes to programs. The group's role is to relate the cost impact changes might have on the total institution's dollar. Mechanisms such as these enable communication with faculty, who are sympathetic, understanding and who can be very helpful. This has been one of the best mechanisms used by USC to save the energy dollar.

Panel: Are there any other comments on energy conservation?

Speaker: No one has talked about efficiency of his plant. For instance, loss of heat—up the stack, down the drain, in air leaks, open doors, insulation, wet insulation, etc. Plants could be improved almost 10% in efficiency if the manpower and materials were available to bring the plant back to design efficiency.

Speaker: Someone previously mentioned automatic control centers. Instituting such centers means spending money to save money, but once the program is operational, it is just a matter of time until it can automatically control load and demand. If buildings were designed to control demand, it would go a long way toward energy conservation and subsequently, dollar savings.

Panel: In summarizing the questionnaires, there is another subject of interest to many administrators—stretching the maintenance dollar and working with reduced budgets. Many administrators are living with these challenges and are aware of what it means and the impact it might have on institutions in terms of long-range deferred maintenance and other arguments. The next topic discussed will be how to effect cost savings and stretch dollars in the day-to-day program. What are some ideas about reducing standards, for example. If reducing standards, how to introduce the program to school officials; how to communicate with faculty; how to handle complaints that may emanate from reducing standards without the benefit of proper communication?

Speaker: This is a very touchy subject. There is a simple answer, however, and that is to design for simplicity. It seems that architects and engineers want to build monuments with beautiful light fixtures, terazzo floors and carpeting, etc. It looks pretty, but the basic function as an institution is still to educate young men and women.

D. Haymond, American University of Washington, D.C.: Simplicity is great, but it is still necessary to deal with buildings not built for simplicity. American University has tried several innovations: One is going back to almost 100% day cleaning. People say this can't be done, but the school decided to try it in a few buildings, and it *can* be done! The program now calls for about 80% day cleaning, as well as for a change in the level of cleaning. Previously, individual faculty and staff offices were cleaned daily, but now all are cleaned *well* once a week. Public areas, secretarial pools, hallways, etc., are cleaned daily. Classrooms have not been a great problem, as usually there is time in a two-hour period to clean a classroom, and this has worked out very well. Faculty and staff have been very pleased with the innovation, and it has also been possible to reduce custodial staff by 20%. The cut was made because most night workers were "moonlighting" and were not as productive as they should have been. Thus, day cleaning has really worked very well. It is a tougher administrative job, and it is necessary to do a good job of scheduling and training personnel, but costwise it is more economical.

Question: I would like to ask John Lammers what his thoughts are on stretching the dollar as it relates to work scheduling.

John Lammers: Planning, scheduling and discipline are the key to work scheduling savings. The primary concern is to segregate the planning function from the implementing function. Start thinking about who does the planning for your organization. Chances are it is the physical plant director, foremen and perhaps some program users. If it is possible to segregate their function from the implementing function, the work will get done more efficiently.

Panel: What Mr. Lammers is saying is that proper planning and scheduling will pay money. More work will get done with the same number of people or just as much with fewer if planning and scheduling are well done.

L. Council, Texas A & M University: Many times line and staff positions are not recognized separately. A very fine engineer is hired and is made a superintendent and is told to take care of everything designing, planning and getting the work done efficiently. The problem arises that the engineer is both a designer and a supervisor, and it simply can't be done. A supervisor, if he really is *supervising*, cannot spend six hours a day worrying about material for tomorrow and about assignment of people for jobs the next day.

Planning has to be divorced from the actual maintenance. Ultimately the foremen will not even see next week's work schedule they will know what is coming up when they are briefed on it. They will have packaged jobs to do, and they will have the material located or ordered for them. Planners will know when they are going to schedule people to work that the building is properly prepared, the material is available and the foremen are briefed.

The principles of separating planning and execution can be seen in the growth pattern of most institutions. When small, most have in-house maintenance, and as the institutions grow these people assume new roles. A point is reached at which supervisory personnel cannot plan the workload effectively. So separations are recognized and a planning and estimating team develops. This, at least, was the history at USC. In the course of doing that, the department realized that many "old timers" who were not on the planning team were terribly demotivated. They felt downgraded and hurt and working personally with them was not 100% successful in bringing them back into the organization.

Lammers: First define what a foreman is and call him a supervisor. Define what he does and his primary responsibilities to lead, guide, direct and manage efforts of craftsmen. Then define a planner or staff man. His duties are to advise and assist without line responsibility. The problem centers primarily over who leads craftsmen. If a school has no planning staff the majority of its foremen are probably doing the work of planners. They are sitting at a desk and are on the phone, ordering materials or talking to program users.

Ted Simon, Michigan State University: About 26 years ago when I joined the Michigan State University staff, I found a relatively small operation which used a buddy system. That is, if a person knew the right people in the department, he could get something done immediately, and if he didn't he may or may not have gotten service. It took a long time to break this system up. In the meantime the physical plant grew tremendously from a small organization of a few trucks and several hundred workmen to six to seven hundred workmen (plus part-time employees), a large fleet and a plant of over 5,000 acres.

However, the system wasn't finally broken up until planning was separated from production. There were a few casualties foremen who refused to accept the concept. It took months and even years to make the transition, but it has been very effective. A substantial amount of money is spent each year on scheduling and planning production planning, expediting and obtaining materials and setting up conditions to produce a job. Net expenditure of time, resources and man-hours is less today than it was before the new system was instituted, and it has been one more way to combat inflation. This program formally started at least five to eight years ago and before that all sorts of informal procedures were tried. Now the system utilizes a computer back up and has become fairly sophisticated.

Panel: Another subject of interest expressed in the questionnaire is related to unionism in the physical plant organization. There were several questions about what to do in combating union efforts to organize personnel. A number of questions were addressed to what to do about problems with unions and specifically, about strikes how to organize to combat a strike within the organization. Apparently there are at least four institutions that have experienced strikes within their organizations in the last year based on these questionnaires. John Tronoff of the University of California/Berkeley will address the subject, as he has had experience in that area.

John Tronoff: UC/Berkeley experienced a strike last year that lasted 10 weeks. One of the most important realizations arising out of it was that if labor problems arise, there has to be a staff available capable of running the campus. The University of Hawaii is fully unionized, and as Phil Koehler indicated, if they had a strike they would have to close the campus.

In Berkeley's case, the chancellor indicated that if there was a strike the school would not shut down. The physical plant divided forces to plan and estimate scheduling. It took some key personnel from various crafts and made them estimator-planners. They were the backbone of the operation during the strike period because they did have some background in various areas of maintenance; regardless of whether the campus is unionized or not the day may come for other institutions when this sort of action must be taken. In Berkeley's case all but 10% of the staff was unionized at the time of the strike; strikers included the entire custodial staff, various craftsmen and stationary engineers. Staff had to operate the central heating plant, steam distribution system and electrical distribution system. It had to organize custodial services and use members of the various departments to assist in this operation. Trash removal was a big problem. The unions attempted to block trash removal. They closed the campus down because of health hazards. Refuse would be taken to the dumps and they would block the trucks at the entrance. They threatened to close the dumps because they were also unionized. Finally the school had to stockpile and get balers to bale the trash.

The problem was finally settled: previously the university had paid construction wages to maintenance workers and the president announced that it would no longer do that. The unions felt that the only way they could win was a work stoppage even though it is illegal to strike. There were quite a few court actions over this, but the unions manipulated the laws and the university was blocked on several points. It was quite a struggle, but I will be glad to answer any questions from the floor, or perhaps others who have had experience might contribute something.

Question: How exactly was the wage problem solved?

Answer: As of July 1 last year all new employees have been hired at maintenance scale. It was decided that incumbents' salaries would be frozen at a red circle rate the construction wage less the value of university benefits received. Their wages are frozen until such time as the maintenance class rates catch up to them, which will be anywhere from three to seven years. In some cases they will never catch up to them. Those particular employees will probably be retired by then.

Panel: How many institutions represented today have their maintenance forces all or partially unionized. (Show of hands.) It appears the majority are unionized.

A University of Hawaii Representative: I hope some of those present will get a chance to look over the campus of the University of Hawaii, as there are both horrible and fine examples of the union system at work. The campus is totally untended except for telephone operators. There is no central alarm system, but there are a few automatic controls to turn things on and off. About six months ago Phil Koehler was finally able to get a man to check the boilers a couple of times a day. Hawaii is in a different situation from most schools because of the climate, but the situation is at times frightening. Nonetheless, the pipes will not freeze if not checked, and most systems are set up to turn themselves off should they fail. It is possible to keep most services running with supervisory personnel except for major repairs. With this situation the university is better able to live with unions than would a less automated institution: completely automating can also cause disagreement from workers whose jobs depend on manual operations. An engineer of one building said they would have liked totally automating it. However, the union required that they have two men on duty at all times in each section, so that is the way the plant was built. The situation is not quite that bad at the University of Hawaii yet.

Panel: Are there other subjects that you would like to exchange from the floor? Is the representative from Stanford here today? As Terry Suber indicated, Stanford was able to win a major decision by classifying all personnel generally as maintenance personnel. They broke down the distinctions between trades and the effort there was to look for significant interchange of duty within trades. Many administrators are probably thinking that an electrician is an electrician and that a plumber shouldn't be asked to do an electrician's job and vice versa; but take the time to inventory skills, because amazingly there is a great deal of overlap and therefore general classification as "maintenance" is possible.

Don Whiston, Massachusetts Institute of Technology: An OSHA incident occurred recently at MIT in which a student worker was killed; the accident led to revamping the safety office and the particular authority of the safety officer. MIT had four safety men before to handle inspections, and since the accident it has been necessary to put on two more men. However, each department and each laboratory had to appoint a safety coordinator who was instructed by the safety office about hazards they should correct. The organization now consists of 173 people trained in safety. At the present time the safety office has the right and authority to tell any department they should do something about a safety hazard. Before the accident the only authority they had was to advise,so the new system is a step forward in correcting some hazards.

Speaker (Of Cornell University): One comment on the Teamsters: About a year ago just the dining organization at Cornell (speaker was not employee of Cornell at the time) was under tremendous pressure to reduce costs, so they laid off seven or eight people. Student workers who supplement dining group staff in the summer, and to a lesser degree during the school year, got interested in unionizing the overall group; they met with the Teamsters and attempted to file for a single unit including students and nonstudents. It took about a year for the NLRB to come to grips with it, but the recent decision is that students cannot be a part of that unit. Cornell now has only the building trades council for craftsmen, but has attempted to get a larger unit (along with the dining group) to enable greater relative strength in the upcoming election. That attempt was also thwarted. This tide is possibly going to shift back and forth, and it may not be too long until there will be several unions within the physical plant department, for example.

Speaker: Across the country there are something like 60 cases before the NLRB for a decision relating to fragmentation. The concept of one trade making up an acceptable unit is being tested again and again.

Speaker: One advantage of having one union represent all employees is illustrated by a case in which 10 or 11 different unions got into jurisdictional hassles continuously. Work designated for sheet metal workers might overlap with one of the others. For example, maintenance machinists affiliate with one union, steamfitters with another and a hassle developed over handrails; the machinist said it was his work and the steamfitter said all pipe work was his work, and the department had to change the specifications to fit the job so that the maintenance machinist could do it at the lower rate. There are various hassles like that, so the fewer unions to contend with the easier it is.

One company did something constructive to avoid being structured by craft-type unions. Basically, it fell to the management task of writing job descriptions and titles. Certainly, if a job description designates electricians separate from cement finishers, then definitely the union will seek to organize along those lines. Job descriptions a little more thoughtfully written emphasize multicraft responsibility and multicraft tasks at each maintenance level. For example, pipe fitters can do welding; they might clean sewer lines as well as put in steam lines.

Speaker: True, the job description is the start and it can help employers. However, the regional director of the NLRB in Los Angeles reminds employers that they must live with these job descriptions. Just simply writing the description is not going to get the job done. Changes in work assignment may have to be made that relate to the new job descriptions written.

Speaker: What has been said about job descriptions on the importance of them is true. The classification at our institution was changed from carpenter, electrician, plumber, etc. to physical plant mechanic, and the job description includes carpentry, electrical work, etc. The department wanted to avoid the "Jack-of-all-trades-master-of-none" position, because it certainly wanted qualified people to perform the jobs and be more or less expert in their particular fields. It does get away from the jurisdictional hassles; in the past an electrician would do so much of a job and stop, and there would be a delay until a carpenter came in to cut a hole in the wall for him; when he was through someone else had to come up and patch the hole and someone else had to paint it and soforth.

G. Miller, University of Nebraska: About five years ago the University of Nebraska changed titles of personnel from carpenter, plumber, electrician, etc., to maintenance man or maintenance mechanic I, II and III grades. This was done for the purpose of interchangability between crafts, and it has worked very well. Recently a state personnel system was developed to classify all state employees of any kind. Some agencies, of course, have carpenters and plumbers, and the university ended up with maintenance mechanics, as mentioned before. The state personnel director decided that a plumber, electrician or carpenter should earn more money than a maintenance mechanic I, II or III. After a lot of discussion and hassling the University has still not been able to convince the director, and he has the authority to set the range of scales. The point now is how to maintain an adequate staff and still have payscale differentials.

Burt Cowman, UCLA: UCLA is doing something Terry Suber said couldn't be done getting rid of a union once it has been established on a campus. It appears that under some policies of the University of California system the influence of the building trade unions, at least, is much diminished on the UCLA campus and will probably disappear in short order. That doesn't mean that some other employee organization is not going to take over the same employees, but at least it appears it will not be the building trades unions. Somebody asked a question on what are the best steps to take to avoid unionism, and it is clear that a very fair personnel policy is the only method that can be used to minimize unionization. That means employees in an institution be treated the same as employees in the same field working for private industry. It certainly doesn't mean that because the university does some alteration work that it has to pay construction rates to carpenters and electricians, etc. There is a difference in employment in an educational institution and working in the construction industry on the outside. By the same token, it does require that somebody investigate the policy in the community and establish personnel regulations and payscales within the university that match them.

As mentioned earlier, institutions have deviated from union construction-related scale and are on the maintenance scale; UCLA has still recruited quite a few electricians and plumbers and carpenters. By the way, UCLA still calls them journeymen carpenters and electricians, etc. There are a number of qualified maintenance people who can do both maintenance work and alteration work, as well as so-called construction work at a much lower rate of pay something like $5.50 per hour compared to the $9 per hour a construction worker would get. The school has nonetheless been successful in recruiting a number of qualified applicants at those rates.

It appears that the construction unions are not interested in representing university employees anymore because the university has demonstrated it can get people outside the construction industry who can do the work required to maintain the institution; by the same token, the institution's older workers who were strong union men felt they were let down by the union in the negotiations with the university. Thus, there is a cooling off of the union attitude at least at UCLA, and it doesn't look much like there will be a return to construction union related payscales at UCLA.

Speaker: I think Burt Cowman is absolutely right, because it is a known fact that salary usually rates third in the list of employee priorities. They usually rate working conditions and fringe benefits ahead of salary. That may not be the case in every area, but the philosophy at SC is to try to do everything the union would do if they were there. The department has allowed workers to set up a grievance review system and has encouraged an atmosphere of communication in which workers can express themselves and be heard by management. This, as well as sensitivity to the salary structure of the community and fairness to employees are the answers. The physical plant director has to represent his employees in the way a union boss would; he has the administrative power to fight for his people and he should do it, whether it be about salary, fringe benefits, etc. Most institutions now realize that and administrators are very aware that unionism is a tremendous influence on their responsibilities, and they are ready to listen.

ACKNOWLEDGEMENTS

APPA's apologies to the participants and attendees at three of the sessions that were found to be impossible to transcribe because of poor quality of the tape recordings.

Clark Hampton, left, spoke on the subject: Beware of Supply Salesmen. He is vice-president of Hillyard Chemical Company, St. Joseph, Missouri, one of the pioneer exhibitors at APPA conventions.

DONALD PARRY
BILL DEVRIES
JIM HENSHAW

The Experience Exchange Session for Small Institutions was directed by panelists: Donald Parry, Evergreen State College; Bill Devries, Simon Fraser University; and Jim Henshaw, Southern Oregon College.

The Experience Exchange Session for Medical Schools had ten participants including the four panelists: Ralph Tuomi, University of Oregon; John Heinz, University of Washington; Allen Gilmore, University of Hawaii; and Robert Butler, University of California at San Diego.

APPA extends its appreciation to the following individuals who served as moderators for the various sessions throughout the convention. Their assistance in introducing speakers, opening and closing meetings on time and guiding question and answer periods made a substantial contribution to the educational activities of the convention.

Robert Butler, University of California, San Diego
Don Gilstrap, University of California, Santa Cruz
Arnold Shafer, University of Southern California, Los Angeles
William Devries, Simon Fraser University, Vancouver, B.C., Canada
John Heinz, University of Washington
Howard Walters, Ohio State University, Columbus, Ohio
Jack Hansen, University of Hawaii, Honolulu
Jim Henshaw, Southern Oregon College
John Gabe, University of California, Santa Barbara
Donald Parry, Evergreen State College
John Korbis, Idaho State University
Ralph Tuomi, University of Oregon Medical School

REGISTRANTS AT 60th ANNUAL MEETING

ALLEY, Robert C.	Midwestern University, Wichita Falls, Texas
ALLEY, Jeanne Mrs.	
ALLEY, Helen (daughter-16)	
*ARAKAWA, Raymond	J.A. SEXAUER MANUFACTURING CO. INC., Honolulu, Hawaii
ARCHIBALD, John L.	Hamlin University, St. Paul, Minnesota
ARCHIBALD, Jean Mrs.	
ARMOUR, John K.	Downsview, Ontario, Canada
*ASTBURY, Louis B.	BETZ LABORATORIES, Trevose, Pennsylvania
ASTBURY, Ruth Mrs.	
*AYSON, Ed	HONEYWELL, INC., Honolulu, Hawaii
BABCOCK, Harold C.	University of Oregon, Eugene, Oregon
BABCOCK, Patricia Mrs.	
BANKUS, John T.	Champlain College, Burlington, Vermont
BANKUS, Charlotte Mrs.	
BARBATTI, Henry T.	University of Tennessee at Chattanooga, Chattanooga, Tennessee
BARBATTI, Eloise Mrs.	
BARKER, Richard	University of California, Berkeley, California
BARKER, Mrs.	
BARKER, Julie (daughter-13)	
BARKER, Kim (daughter-12)	
BEANE, William F.	New Hampshire College, Manchester, New Hampshire
BEANE, Ellen Mrs.	
BEANE, William O.	New Hampshire College, Manchester, New Hampshire
BEANE, Ora Mrs.	
BECHTEL, Paul B.	Central Washington State College, Ellensburg, Washington
BECHTEL, Joyce Mrs.	
*BECKER, Phil	HUNTERS INC., Kailua, Oahu, Hawaii
BELLOMY, W. Albert	University of Houston, Houston, Texas
BELLOMY, Ann Mrs.	
BELOAT, Larry D.	Christian Theological Seminary, Indianapolis, Indiana
BELOAT, Joyce Mrs.	
BERGERON, Joe	Quebec, Canada
BERGERON, Mrs.	
BERLING, James P.	Houston, Texas
BLASS, Anthony	Southern Illinois University, Carbondale, Illinois
BLASS, Lois Mrs.	
BOEN, Harold D.	University of California, Riverside, California
BOHUSLAV, Willie	Baylor College of Medicine, Houston, Texas
BOHUSLAV, Joyce Mrs.	
*BOLDON, Charles M.	UNICON PARKING STRUCTURES, Van Nuys, California
BOLDON, Donna Mrs.	
BOLLINGER, Byron	California State University, San Jose, California
BOLLINGER, Dorothy Mrs.	
BONEBRAKE, Case A.	Kansas State University, Manhattan, Kansas
BONEBRAKE, Marie Mrs.	
BOURASSA, Giles	University of Quebec, Three Rivers, Quebec, Canada
BOURASSA, Mrs.	
BRASWELL, Charles C.	Appalachian State University, Boone, North Carolina
BRASWELL, Julia Mrs.	
BRASWELL, Martha (daughter-16)	
BRASWELL, Marcia (daughter-16)	
BREUNING, Carl G.	Oberlin College, Oberlin, Ohio
BREUNING, Dorothy Mrs.	
BREWSTER, Sam F.	Brigham Young University, Provo, Utah
BROOKS, Howell H.	Indiana University, Bloomington, Indiana
BROOKS, Harriet Mrs.	
BROUILLARD, Richard	Rouyn, Quebec, Canada
BROWNE, Stuart	Chaminade College, Honolulu, Hawaii
BURFORD, Wesley R.	California State College, Sonoma, California
BURFORD, Margaret Mrs.	

BURKE, John	California State University, Sante Fe, California
BUSH, Sam	University of Hawaii, Honolulu, Hawaii
PUSH, An[illegible] Mrs.	
BUTLER, Charles W.	University of South Florida, Tampa, Florida
BUTLER, Jo Mrs.	
BUTLER, Robert M	University of California at San Diego, La Jolla, California
BUTLER, Virginia Mrs.	
*CABOT, Matt	MATT CABOT & ASSOCIATES, Honolulu, Hawaii
*CAHILL, Joe	RUSSWIN-EMPIRE PACIFIC, Honolulu, Hawaii
*CAMERON, A. B.	CARRIER AIR CONDITIONING CO., Ontario, Canada
CAMERON, Alda Mrs.	
*CAMP, Walter	S.C. JOHNSON & SON, Honolulu, Hawaii
CARPENTER, Clayton A.	University of Nevada, Reno, Nevada
CARPENTER, Mrs.	
CARTER, Asa Melton	Troy State University, Troy, Alabama
CARTER, Betty Mrs.	
*CARTER, Fred W.	JOHNSON WAX, Honolulu, Hawaii
CHALMERS, Alexander	Howard University, Washington, D.C.
CHALMERS, Minnie Mrs.	
CHARLESTON, William W.	California State Univ./San Francisco, S.F., California
CHARLESTON, Elinor Mrs.	
COBB, Francis B.	Essex County College, Newark, New Jersey
COBB, Ella Mrs.	
COBB, Purl	Grand Valley State College, Allendale, Michigan
COBB, Grace Mrs.	
COLLINS, Richard	Detroit, Michigan
CONLEY, Booker	Tuskegee Institute, Tuskegee Institute, Alabama
CONLEY, Dorothy Mrs.	
*COOMBS, Mike	XEROX CORPORATION, Honolulu, Hawaii
COUCH, Robert O.	RIC-WIL, INC., Wadsworth, Ohio
COUCH, Mrs.	
COUNCIL, Logan	Texas A & M University, College Station, Texas
COUNCIL, Juanita Mrs.	
COWMAN, V. Burt	University of California/Los Angeles, L.A., California
COWMAN, Mrs.	
COWMAN, Jordon (son)	
CRALL, Paul C.	University Texas/Medical School at San Antonio, San Antonio, Texas
CRALL, Helen Mrs.	
CROSS, Gene B.	University of Utah, Salt Lake City, Utah
CROSS, Anita Mrs.	
CROSSEY, James L.	Colorado College, Colorado Springs, Colorado
CROSSEY, Anna Mae Mrs.	
CUNNINGHAM, Charles L.	U.S. Air Force Academy, Colorado
CUNNINGHAM, Jo Mrs.	
CUSHMAN, Parker G.	University of Maine at Orono, Orono, Maine
DAVIS, Robert D.	University of Guelph, Guelph, Ontario, Canada
DAVIS, Mrs.	
DAWSON, CHARLES S.	Southern Methodist University, Dallas, Texas
DAWSON, Helen Mrs.	
DEMBROWSKI, Michael	Southern Connecticut State College, New Haven, Conn.
DEMBROWSKI, Janet Mrs.	
DENUES, C. H. Mrs. (GUEST of James	Wessels) Lexington, Kentucky
*DEPOT, Robert L.	SCHLAGE LOCK COMPANY, Honolulu, Hawaii
DEPOT, Miriam Mrs.	
DESCH, Noel	Cornell University, Ithaca, New York
DESCH, Janet Mrs.	
DeVRIES, William	Simon Fraser University, Burnaby 2, B.C., Canada
DeVRIES, Heather Mrs.	
DeWEESE, Forest L.	Millikin University, Decatur, Illinois
DeWEESE, Wilma Mrs.	

DeWOLF, Peter	Simon Fraser University, Burnaby 2, B.C., Canada
DeWOLF, Doris Mrs.	
DeYOUNG, Dan	Stanford University, Stanford, California
*DICKINSON, A. Litchard	INTERROYAL, New York, N.Y.
Di DONATO, S. Leonard	Mercer County Community College, Trenton, New Jersey
Di DONATO, Eve Mrs.	
Di DONATO, Brooks	
DIXON, Leonard B.	Riverdale, Maryland
DIXON, Edith Mrs.	
DONAHUE, Guy L.	College deSherbrooke, Sherbrooke, Quebec, Canada
DONAHUE, Denis Mrs.	
DORAN, Daniel	Quebec 10, Canada
*DORIUS, Carl B.	AMERICAN GILSONITE, Salt Lake City, Utah
DORIUS, Joyce Mrs.	
DOWNES, M. R.	Los Angeles Community Colleges, Los Angeles, California
DOWNES, Louise Mrs.	
DUDA, James A.	Sangamon State University, Springfield, Illinois
DUDA, Patricia Mrs.	
DUGGAN, Francis	University of Maryland at Baltimore, Baltimore, Maryland
DUGGAN, Peggy Mrs.	
DUNGAN, James O.	University of Rochester, Rochester, New York
DUNGAN, Vera Mrs.	
*DUNPHY, Thomas	RIC-WIL INC., Santa Clara, California
EBERT, Harry F.	Duke University, Durham, North Carolina
EBERT, Harriet Mrs.	
EBESUTANI, Ellen	University of Hawaii, Honolulu, Hawaii
ELLIOTT, Eugene E.	University of Puget Sound, Tacoma, Washington
ELLIOTT, Phyllis Mrs.	
*ELMBLAD, Warren L.	SARGENT & COMPANY, New Haven, Connecticut
*ENGLE, Robert S.	UNION PARKING STRUCTURES, Van Nuys, California
ENGLE, Ingrid Mrs.	
FAHLE, H. E. (GUEST of Harald Sire)	Quebec, Canada
FARLEY, Robert J.	Occidental College, Los Angeles, California
FARLEY, Glennie Jean Mrs.	
FARRELL, Roger	Quebec, Canada
FARRELL, Mrs.	
*FELDMAN, Edwin B.	SERVICE ENGINEERING ASSOCIATES, Atlanta, Georgia
FELDMAN, Zelda Mrs.	
FISH, James M.	Mars Hill College, Mars Hill, North Carolina
FISH, Gwyn Mrs.	
FOLTS, Burr C.	State University of N.Y. at Buffalo, Buffalo, New York
FOLTS, Sally Mrs.	
FRANKE, George S.	Austin College, Sherman, Texas
*FRIZELLE, Fred	AMERICAN GILSONITE COMPANY, Salt Lake City, Utah
FUJINAKA, Howard	HUNTERS INC., Honolulu, Hawaii
GABE, John A.	University of California, Santa Barbara, California
GABE, Marguerite Mrs.	
GAMET, Lyle	University of Washington, Seattle, Washington
GAMET, Geraldine Mrs.	
GARIBALDI, Nat A.	Univ. of California at San Francisco, S.F., California
GATES, Ralph B.	Radcliffe College, Cambridge, Massachusetts
GATES, Ruth Mrs.	
GEBUHR, John V.	Indiana University/Indianapolis, Indianapolis, Indiana
GEIGER, Walter C.	Bucknell University, Lewisburg, Pennsylvania
GEIGER, Lois Mrs.	
*GESSER, John	JOHNSON SERVICE, Honolulu, Hawaii
GIERSCH, Russell N.	The University of Akron, Akron, Ohio
GLAZE, Harold R.	Cleveland State University, Cleveland, Ohio
GLAZE, Mona Mrs.	
*GOLDMAN, Norman L.	VOLUME INDOOR PARKING, New York, New York.
GOLDMAN, Mrs.	

*GOLDSBERRY, Edward	KOOLSHADE CORPORATION, Glendale, California
GRATTON, Jean O.	University DeMontreal, Montreal, Quebec, Canada
*GRIFFITH, Donald	RUSSWIN, Berlin, Connecticut
GRUBBS, Lonzo J.	Texas A & M University, College Station, Texas
GURLEY, Nestus H.	University of North Carolina, Greensboro, North Carolina
GURLEY, Eunice Mrs.	
HAACK, Dale A.	University of Minnesota, Minneapolis, Minnesota
HAFER, Robert L. Jr.	University of Maryland, College Park, Maryland
HAFER, Nancy Mrs.	
HAINES, James M.	Catonsville Community College, Catonsville, Maryland
HAINES, Jean Mrs.	
*HALEY, Ray	HILLYARD CHEMICAL, Honolulu, Hawaii
HALL, Robert	University of Hawaii, Honolulu, Hawaii
*HAMPTON, Clark W.	HILLYARD CHEMICAL, St. Joseph, Missouri
HAMPTON, Nancy Mrs.	
HANSEN, John L.	University of Hawaii, Honolulu, Hawaii
*HAPPERSBERGER, Carl	VON DUPRIN, INC., Indianapolis, Indiana
HAPPERSBERGER, Bonnie Mrs.	
HARTMAN, Walter L.	Ohio State University, Columbus, Ohio
HARTMAN, Bernice Mrs.	
HASHIMOTO, Jack	Dept. of Transportation (Airport Division) Hon., Hawaii
HAWN, Dale L.	Grinnell College, Grinnell, Iowa
HAWN, Lorraine Mrs.	
HAYMOND, Denver D.	The American University, Washington, D.C.
HAYTER, Kenneth S.	South Dakota State University, Brookings, South Dakota
HAYTER, Vi Mrs.	
HAYWORTH, Ron	RUSSWIN, Honolulu, Hawaii
HEE, Annette	University of Hawaii, Honolulu, Hawaii
HEE, Robert	
HEE, Jacob	Dept. of Transportation (Airport Division) Hon., Hawaii
HEINZ, John A.	University of Washington, Seattle, Washington
HEINZ, Theo Mrs.	
HEINZ, Kathy (daughter-13)	
HEINZ, Steve (son-8)	
*HENKLE, Pete	JOHNSON SERVICE, Honolulu, Hawaii
HENSHAW, James L.	Southern Oregon College, Ashland, Oregon
HENSHAW, Margaret Mrs.	
HEPLEY, William E.	Indiana University, Bloomington, Indiana
HEPLEY, Analie Mrs.	
HIGA, Nancy	University of Hawaii, Honolulu, Hawaii
HILL, Clyde B.	University of South Florida, Tampa, Florida
HOFFMAN, Donald (GUEST of Edison D. Reynolds) Marion, Indiana	
HOFFMAN, Ruby Mrs.	
HOLBERG, Donald L.	University of Minnesota, Minneapolis, Minnesota
HOLBROOK, Sumner S.	The Phillips Exeter Academy, Exeter, New Hampshire
HORSEY, William H.	University of Maryland, College Park, Maryland
HORTNESS, Mel	The Claremont Colleges, Claremont, California
HORTNESS, Bernice Mrs.	
*HOWARD, Paul	AMERICAN BILTRITE RUBBER COMPANY, Boston, Massachusetts
*HUBENTHAL, John W.	CERAMIC COOLING TOWER CO., Fort Worth, Texas
HUBENTHAL, Gertrude Mrs.	
HUBER, Ralph E.	University of Texas at Austin, Austin, Texas
HUBER, Mildred Mrs.	
HUDLIN, Warrington W.	East St. Louis, Illinois
HUDLIN, Helen Mrs.	
HUDLIN, Reginald E.	East St. Louis, Illinois
HUFFORD, Tom	SCHLAGE LOCK COMPANY, San Francisco, California
*IGOE, Roy	HILLYARD CHEMICAL, Honolulu, Hawaii
IHA, David	Kauai Community College, Lihue, Kauai, Hawaii
INDREGINAL, Kenneth	Leeward Community College, Pearl City, Oahu, Hawaii
INGRAM, Frances Mrs.	Rhode Island School of Design, Rhode Island

INGRAM, Harold W	Rehoboth, Massachusetts
INOUYE, Satoru	Dept. of Accounting & General Services, Honolulu, Hawaii
IOLI, Anthony	University of Hawaii, Honolulu, Hawaii
JANTHO, Charles R.	University of Maryland, College Park, Maryland
JOHNSON, George F.	Tulane University, New Orleans, Louisiana
JOHNSON, Aline Mrs.	
JOHNSON, Joseph S.	Bountiful, Utah
JOHNSON, Yvonne Mrs.	
*KALOYANIDES, John L.	VAPONICS, INC., Plymouth, Massachusetts
KALOYANIDES, Marje Mrs.	
KALOYANIDES, Susan (daughter-14)	
KALOYANIDES, Lyn (daughter-12)	
KALOYANIDES, Kathy (daughter-10)	
KAPIKO, Jerrold L.	
KARAS, George	Oakland University, Rochester, Michigan
KARAS, Gertrude Mrs.	
KAU, George	Leeward Community College, Oahu, Hawaii
KEMPTON, Seldon L.	California State Polytechnic College, Pomona, Calif.
KEMPTON, Virginia Mrs.	
KENDRICK, Ruth F.	Fort Collins, Colorado
KENNEDY, Virginia	University of Hawaii, Honolulu, Hawaii
*KITKOUSKI, Ed	JOHNSON SERVICE, Honolulu, Hawaii
KNAPP, Paul T.	APPA Headquarters, Washington, D.C.
KNAPP, Peggy Mrs.	
KOBAYASHI, Thema	University of Hawaii, Honolulu, Hawaii
KOEHLER, Philip	University of Hawaii, Honolulu, Hawaii
KOEHLER, Pam Mrs.	
KORBIS, John	Idaho State University, Pocatello, Idaho
KORTH, D. W.	E.E. Black, Honolulu, Hawaii
KORTH, Olga Mrs.	
KRAGER, William R.	Anchorage Community College, Anchorage, Alaska
KRENZER, Robert V.	University of Nebraska, Omaha, Nebraska
KRENZER, Mrs.	
*LAMBERT, John	XEROX CORPORATION, Honolulu, Hawaii
*LAMBIE, Alan	SARGENT LOCK, Kailua, Oahu, Hawaii
*LAMMERS, John	A.T. KEARNEY CONSULTANTS, San Francisco, California
LANDSNESS, Gordon L.	Sacramento State College, Sacramento, California
LANDSNESS, Patricia Mrs.	
LAPPIN, Ernest A. (GUEST)	Waterloo, Ontario, Canada
LAU, Kelvin	AMERICAN BILTRITE, Honolulu, Hawaii
LEAVER, Eugene H.	University of New Hampshire, Durham, New Hampshire
LEAVER, Jeanne Mrs.	
LECOMPTE, Yvonne	New Orleans, Louisiana
LEMAY, Guy	Quebec, Canada
LEMAY, Claire Mrs.	
LEVIN, Carl	California State University at Fresno, Fresno, California
LEWICKI, Arthur A.	University of Texas at Houston, Houston, Texas
LIVINGSTON, Robert	CARRIER AIR CONDITIONING COMPANY, Fayetteville, N.Y.
LIVINGSTON, Joan Mrs.	
LOBBAN, William	University of Waterloo, Ontario, Canada
LONG, Robert B.	Central Michigan University, Mount Pleasant, Michigan
LONG, Pat Mrs.	
*LOPER, Leslie L.	THERMAL CONDUITS INC., Kirkland, Washington
LOPER, Eleanor Mrs.	
*LOWRY, James H.	LCN CLOSERS, Princeton, Illinois
LOWRY, Madeline Mrs.	
LYON, Edwin V.	University of Notre Dame, Notre Dame, Indiana
*MANN, Ned R.	CARRIER AIR CONDITIONING COMPANY, Syracuse, N.Y.
MANN, Cynthia Mrs.	
MARTIN, Hunt V. Jr.	University of Pittsburgh, Pittsburgh, Pennsylvania
MARTIN, Ronald	Hawaii Loa College, Kailua, Oahu, Hawaii

MATTERS, George W	Thomas Jefferson University, Philadelphia, Pennsylvania
MATTERS, Corkey Mrs.	
*MAXWELL, Philip J. Jr.	HAGER HINGE, Honolulu, Hawaii
McDONALD, John W.	Bowie, Maryland
*McGLINCEY, John C.	HUSSEY MANUFACTURING COMPANY, Alfred, Maine
McGLINCEY, Mrs.	
McGLINCEY, Catherine (daughter-10)	
McGLINCEY, Christopher (son-7)	
McGUIRE, Francis S.	University of Maine, Bangor, Maine
McGUIRE, June M. Mrs.	
McKAY, Billy P.	University of Tennessee, Memphis, Tenn.
McKAY, Hildur Mrs.	
McKEE, I.C. Mrs. (GUEST OF Mr. & Mrs. Robert Long)	Mount Pleasant, Michigan
McKENZIE, William	Frostburg State College, Frostburg, Maryland
McKENZIE, Willie Ann Mrs.	
McNEILEY, Francis	HILLYARD CHEMICAL, St. Joseph, Missouri
MILLER, Eugene L	University of Chicago, Chicago, Illinois
MILLER, Jane Mrs.	
MILLER, George R	University of Nebraska, Lincoln, Nebraska
MILLER, Bettimarie Mrs.	
MITCHELL, Frank E	Tacoma Community College, Tacoma, Washington
MITCHELL, H. R. Jr	University of Mississippi, University, Mississippi
MOORE, Edwin E	Bedford, Massachusetts
MOORE, Barbara Mrs.	
MOORE, Susan (daughter-17)	
MOORE, George	University of Cincinnati, Cincinnati, Ohio
MOORE, Jeff (son-17)	
MOORE, Sally (daughter-15)	
MOORLEGHEN, Charles	Southern Illinois University, Edwardsville, Illinois
MORGAN, Charles W	University of Windsor, Windsor, Ontario, Canada
MORI, Alfred	Dept. of Transportation (Airport Division) Hon., Hawaii
MORIARTY, Richard V.	University of Alaska, Fairbanks, Alaska
MORIARTY, Mary Mrs.	
MORIARTY, Joanne (daughter-18)	
MORRIS, Neill C.	Baylor University, Waco, Texas
MORRIS, Nell Mrs.	
MURAOKA, Walter	University of Hawaii, Honolulu, Hawaii
MURPHY, William	Harvard University, Allston, Massachusetts
MURPHY, Marilyn Mrs.	
MURRAY, Donald S.	College of Lake County, Grayslake, Illinois
MURRAY, Joanne Mrs.	
NAGASAKI, Hatsue	University of Hawaii, Honolulu, Hawaii
NAKAMURA, Richard	Dept. of Acctg & Gen Servs., Honolulu, Hawaii
NIVER, Grant	
NOEL, Thomas	Memorial University of Newfoundland, St. John's, Newfoundland, Canada
NOEL, Ella Mrs.	
NOLLSCH, Duane A.	University of Iowa, Iowa City, Iowa
NOLLSCH, Mrs.	
NORTON, George A.	University of Massachusetts, Amherst, Massachusetts
NORTON, Jane Mrs.	
OAKES, Edward	Kamehameha Schools, Honolulu, Hawaii
OAKLEY, Kathy (GUEST)	Mars Hill, North Carolina
O'BRYANT, Arch C.	UCLA, Los Angeles, California
O'BRYANT, Ruth Mrs.	
ODA, Francis	University of Hawaii, Honolulu, Hawaii
OKADA, Shigeru	Dept of Acctg & Gen Servs, Honolulu, Hawaii
O'NEILL, Lawrence F.	Junior College District of St. Louis, St. Louis, Missouri
O'NEILL, Dorothy Mrs.	
ORLANDO, Raymond D.	Youngstown State University, Youngstown, Ohio
ORLANDO, Ruth Mrs.	
OSHIMA, Robert	TERRITORIAL DISTRIBUTORS, Honolulu, Hawaii

PALMER, Roger D.	Mary Baldwin College, Staunton, Virginia
PALMER, Donna Mrs.	
PALMIERI, Rose E. (GUEST of Michael Dembroski)	New Haven, Connecticut
PARKER, J.A.	University of Montana, Missoula, Montana
PARKER Venice Mrs.	
PARRY, Donald S.	Evergreen State College, Olympia, Washington
PASCUZZO, Paul (GUEST of William Charleston)	Dale City, California
PHILLIPS, James B.	Pacific Lutheran University, Tacoma, Washington
PHILLIPS, Ronald E.	University of Alberta, Edmonton, Alberta, Canada
PHILLIPS, Jackie Mrs.	
PODESZWA, David	JOHNSON SERVICE COMPANY, Milwaukee, Wisconsin
POGUE, Elmer R.	Arapahoe Community College, Littleton, Colorado
POLICAY, Emil T.	Ithaca College, Ithaca, New York
POLICAY, Betty Mrs.	
POPRAVSKY, Wallace	Mercy College of Detroit, Detroit, Michigan
POPRAVSKY, Lelia Mrs.	
POPRAVSKY, Nick (son-17)	
POPRAVSKY, Lori (daughter-14)	
POPRAVSKY, Cindy (daughter-6)	
POPRAVSKY, Grace (mother)	
PROVAN, Charles G.	Queen's University, Kingston, Ontario, Canada
PROVAN, Mrs.	
READING, Willard	Delta College, University Center, Michigan
READING, Connie Mrs.	
RECTOR, Phillip G.	California Inst. of Technology, Pasadena, California
RECTOR, Winnie Mrs.	
REICHERT, David	University of Northern Colorado, Greeley, Colorado
REICHERT, Dorothy Mrs.	
REITZ, Norbert E.	St. Louis University, St. Louis, Missouri
REITZ, Wanda Mrs.	
REITZ, Jeff (son-12)	
REYNOLDS, Edison D.	Ft. Wayne Bible College, Ft. Wayne, Indiana
REYNOLDS, Clara Mrs.	
ROBERTS, Erb. C.	Vanderbilt University, Nashville, Tennessee
ROBERTS, Mary Ellen Mrs.	
ROBERTSON, James C.	Central Piedmont Community College, Charlotte, N. Carolina
ROBERTSON, Peg Mrs.	
ROBERTSON, Marjie (daughter-14)	
ROBERTSON, Linda (daughter-12)	
*ROBINSON, Jess W.	GYMNASTIC SUPPLY COMPANY, San Pedro, California
ROBINSON, Abbey Mrs.	
ROBINSON, Omar A.	Wilberforce University, Wilberforce, Ohio
ROBINSON, Barbara Mrs.	
RODDA, Allen	California State University at Hayward, Hayward, Calif.
RODDA, Martha Mrs.	
*ROGERS, Ken	HONEYWELL INC., Honolulu, Hawaii
ROYCE, Charles	ROYCE ROLLS RINGER COMPANY, Grand Rapids, Michigan
ROYCE, Mrs.	
RUTHERFORD, Bruce A.	Washington State University, Pullman, Washington
RUTHERFORD, Betty Mrs.	
*SABALA, Ronald A.	PERMA PIPE, Chicago, Illinois
SANDERSON, John C.	Northwestern University, Evanston, Illinois
SANDERSON, Mary Ruth Mrs.	
SANO, George	Maui Community College, Kahului, Maui
SANO, Shigeru	Dept. of Acctg & Gen Servs, Honolulu, Hawaii
SANTOS, Tony (GUESTS of Harold Ingram)	Rhode Island School of Design, Rhode Island
SANTOS, Mary Mrs.	
SARRA, James W.	State University of New York at Buffalo, Buffalo, N.Y.
SARRA, Dorothy Mrs.	
*SAUNDERS, Missy	XEROX CORPORATION, Honolulu, Hawaii
SEILER, Elivira Mrs. (GUEST of Howard Walters)	Columbus, Ohio

SHAFER, Arnold F.	University of Southern California/Los Angeles, L.A., California
SHAFER, Kathy Mrs.	
SHARP, William J.	Denison University, Granville, Ohio
SHARP, Becky Mrs.	
SHORTREED, John (EMERITUS)	London, Ontario, Canada
SHORTREED, Edith Mrs.	
SHOWALTER, Robert H.	Ball State University, Muncie, Indiana
SHOWALTER, Garnet Mrs.	
SIMON, Roy (GUEST of Ted Simon)	East Lansing, Michigan
SIMON, Mrs.	
SIMON, Ted B.	Michigan State University, East Lansing, Michigan
SIMON, Mary Jane Mrs.	
SIPES, Sherrill	Los Angeles, California
SIPES, Mrs.	
SIRE, Harald E.	Sir George Williams University, Quebec, Canada
SIRE, Doris Mrs.	
SIRE, Cora (daughter)	
SMITH, Ewing	Dutchess Community College, Poughkeepsie, New York
SMITH, Clarissa B. Mrs.	
SMITH, Jay	SCHLAGE LOCK COMPANY, San Francisco, California
SMITH, J. McCree	North Carolina State University, Raleigh, N. Carolina
SMITH, John R.	Defiance College, Defiance, Ohio
SMITH, Maureen Mrs.	
SMITH, Neville	University of British Columbia, Vancouver, B.C., Canada
SMITH, Patricia Mrs.	
SNELSON, Frances (GUEST of James Fish)	Mars Hill, North Carolina
*SNYDER, Howard O.	BEST LOCK CORPORATION, Indianapolis, Indiana
SOUMIS, Francois	University of Quebec, Three Rivers, Quebec, Canada
SOUMIS, Mrs.	
SPEDOWSKI, Joseph A.	Ferris State College, Big Rapids, Michigan
SPEDOWSKI, Joyce Mrs.	
SPILMAN, Neal	Southern Illinois University, Carbondale, Illinois
STANTON, William M.	Swarthmore College, Swarthmore, Pennsylvania
STANTON, Lois Mrs.	
STOCKWICZ, Henry	Hudson Valley Community College, Troy, New York
STOCKWICZ, Eleanor Mrs.	
STORMONT, Riley D. (EMERITUS)	Kansas State Teachers College, Emporia, Kansas
STORMONT, Florine Mrs.	
STRAND, James M.	STRANCO, Bradley, Illinois
STUBBART, Jack	Punahou School, Honolulu, Hawaii
STUBBART, Mrs.	
SUART, George C.	Vancouver, B.C., Canada
SUART, Sylvia Mrs.	
SUBER, Terry	Colorado State University, Fort Collins, Colorado
SUBER, June Mrs.	
SULLIVAN, Edward H.	Babson College, Babson Park, Massachusetts
SULLIVAN, Betty Mrs.	
SWEENEY, Mildred A. Mrs. (EMERITUS)	Lake San Marcos, California
SWEITZER, John H.	Earlham College, Richmond, Indiana
SWEITZER, Rusty Mrs.	
*TAKAKI, James	STANDARD DRYWALL PRODUCTS, Honolulu, Hawaii
TALLEY, Joe	University of Arkansas, Fayetteville, Arkansas
TALLEY, Frances, Mrs.	
TALLEY, Susan Jo (daughter-16)	
TEMPLE, Thomas S.	Medical College of Virginia, Richmond, Virginia
TENNANT, Arthur A.	University of Maryland at Baltimore, Baltimore, Maryland
TENNANT, Sybil Mrs.	
*TENNITY, William P.	CERAMIC COOLING TOWER, La Calico, Texas
TOWNE, Ted	University of Illinois, Chicago Campus, Chicago, Illinois
TOWNE, Mrs.	
TRAVIS, Joe	HONEYWELL, INC., Honolulu, Hawaii

TRIMBLE, Cecil J.	Northern Illinois University, Dekalb, Illinois
TRIMBLE, Ruth Mrs.	
TRONOFF, John E.	University of California at Berkeley, Berkeley, Calif.
TRONOFF, Dagny Mrs.	
TUOMI, Ralph E.	University of Oregon Medical School, Portland, Oregon
TUOMI, Eleanore Mrs.	
TWYCROSS, Randy	Whittier College, Whittier, California
TWYCROSS, Randy (son-10)	
VINCENT, Katherine P. (GUEST of Dembrowski)	New Haven, Connecticut
VON BIEBERSTEIN, Curt R. Jr.	University of Texas, Austin, Texas
VON BIEBERSTEIN, Florene Mrs.	
WADE, Walter W.	Purdue University, West Lafayette, Indiana
WAGNER, Lynn M.	Skidmore College, Saratoga Springs, New York
WAGNER, Ruth Mrs.	
WALTERS, Howard D.	Ohio State University, Columbus, Ohio
WALTERS, Dorothy Mrs.	
WEBER, George O	University of Maryland, College Park, Maryland
WEBER, Mrs.	
WELANETZ, Peter P.	Williams College, Williamstown, Massachusetts
WELANETZ, Janet Mrs.	
WESSELS, James E.	University of Kentucky, Lexington, Kentucky
WESSELS, Nancy Mrs.	
WESSELS, Ann (daughter-11)	
WHALEN, Martin	Montana State University, Bozeman, Montana
WHALEN, Ella Mae Mrs.	
WHENHAM, James E.	Cableton University, Ottawa, Canada
WHISTON, Donald	Massachusetts Inst. of Technology, Cambridge, Mass.
WHISTON, Bettie Mrs.	
WHITE, Weston	Church College, Laie, Oahu, Hawaii
WHITMAN, William W.	Iowa State University, Ames, Iowa
*WILLIAMS, Jim	STRANCO, Honolulu, Hawaii
WILLIAMS, Ralph	STANDARD DRY WALL PRODUCTS, INC., Los Altos, California
WILLIAM , Robert H.	Western Michigan University, Kalamazoo, Michigan
WILLIAMS, Evelyn Mrs.	
WILLIAMS, Roger	St. Louis University, St. Louis, Missouri
WILLIAMS, Lois Mrs.	
WOLFE, James D.	Prince George's Community College, Largo, Maryland
WOLFE, Mary Lou Mrs.	
WOOD, Robert	Hawaii Loa College, Kailua, Oahu, Hawaii
WONG, Philip K.C.	University of Hawaii, Honolulu, Hawaii
WONG, Priscilla	
WONG, Steven	Dept. of Transportation, (Airport Division) Hon., Hawaii
WOOLSEY, Raymond	San Jose, California
WOOLSEY, Rhea Mrs.	
*YAMANAKA, Ron	XEROX CORPORATION Honolulu, Hawaii
YEO, R.M.	University of Western Ontario, London 72, Canada
YUEN, Elmer	University of Hawaii, Honolulu, Hawaii
YUEN, Barbara Mrs.	
ZELLNER, Wilbur R. (EMERITUS)	Flossmoor, Illinois
ZELLNER, Eleanor Mrs.	

*Exhibitors at 60th Annual Meeting

ONE FINAL TOAST TO THE HOST COMMITTEE:

Phil Koehler, director of facilities management at the University of Hawaii, and his enthusiastic and competent staff transformed many in the APPA ranks from skeptics into believers as a result of their outstanding performance as hosts of APPA's 60th Annual Convention. APPA has now taken a major step among educational associations by proving itself capable of conducting a major convention beyond the confines of the continent, overcoming the many economic and logistical problems that such an effort entails. It has achieved status and prestige by doing so. Without the foresight of Phil Koehler and others with confidence and determination, this major step could and would not have been possible. APPA extends its sincere gratitude to all who helped make the event possible through their assistance and support. May the spirit of Aloha generated at Hawaii prevail throughout the Association's activities for many years to come.

HOST COMMITTEE—Front row, Phil Koehler and Annette Hee. Second row, left to right, Phil Wong and Elmer Yuen.

AND HOST COMMITTEE HELPERS: Johnny Ong (Left); Barbara Yuen (Left Below); Walter Gomes (Below); and Priscilla Wong and Virginia Kennedy.

ALOHA OE
(FAREWELL TO THEE)

Aloha oe, aloha oe
E ke onaona noho i ka lipo
One fond embrace, a hoi ae au
Until we meet again.

Farewell to thee, farewell to thee
Thou charming one who dwells among the bowers
One fond embrace before I now depart
Until we meet again.